INSTRUCTION MANUAL

REGULATED POWER SUPPLIES

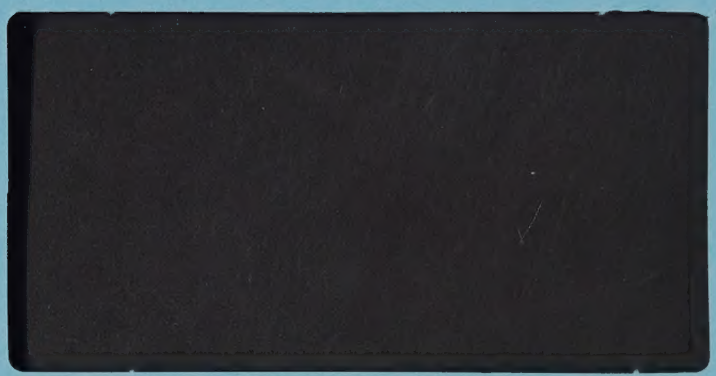
OUL 350

LCS-4 SERIES

This manual applies to units
bearing serial no. prefixes A-F.

LAMBDA

LAMBDA ELECTRONICS MELVILLE, L. I., N. Y.



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This manual provides instructions intended for the operation of Lambda power supplies, and is not to be reproduced without the written consent of Lambda Electronics. All information contained herein applies to all LCS-4 models unless otherwise specified.

LAMBDA ELECTRONICS MELVILLE, L.I., N.Y.

MAIN PLANT TELEPHONE: 516 MYrtle 4-4200

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SPECIFICATION AND FEATURES

Specifications apply for all models.

DC OUTPUT--Voltage regulated for line and load.

TABLE I

VOLTAGE AND CURRENT

RANGES

MODEL	VOLTAGE RANGE	MAXIMUM CURRENT (AMPS) AT AMBIENT TEMPERATURE			
		40°C	50°C	60°C	71°C
LCS-4-2	2±5%	4.5	3.9	3.1	2.0
LCS-4-3	3±5%	4.5	3.9	3.1	2.0
LCS-4-3P6	3.6±5%	4.5	3.9	3.1	2.0
LCS-4-4	4±5%	4.5	3.9	3.1	2.0
LCS-4-4P5	4.5±5%	4.4	3.7	2.9	1.8
LCS-4-5	5±5%	4.4	3.7	2.9	1.8
LCS-4-6	6±5%	4.0	3.4	2.6	1.5
LCS-4-8	8±5%	4.0	3.4	2.6	1.5
LCS-4-10	10±5%	3.2	2.8	2.2	1.3
LCS-4-12	12±5%	3.1	2.8	2.2	1.3
LCS-4-15	15±5%	2.8	2.6	2.1	1.3
LCS-4-18	18±5%	2.6	2.4	2.0	1.2
LCS-4-20	20±5%	2.4	2.2	1.9	1.1
LCS-4-24	24±5%	2.2	1.8	1.5	0.95
LCS-4-28	28±5%	2.0	1.6	1.4	0.85
LCS-4-36	36±5%	1.8	1.5	1.3	0.85
LCS-4-48	48±5%	1.2	1.1	0.9	0.75
LCS-4-100	100±5%	0.46	0.46	0.46	0.34
LCS-4-120	120±5%	0.40	0.40	0.40	0.30
LCS-4-150	150±5%	0.32	0.32	0.32	0.25

TABLE I (Cont'd)

Model	VOLTAGE RANGE	MAXIMUM CURRENT (AMPS) AT AMBIENT TEMPERATURE			
		40°C	50°C	60°C	71°C
LCS-4-01	0-7	3.3	3.0	2.3	1.5
LCS-4-02	0-18	1.8	1.6	1.2	0.8
LCS-4-03	0-32	1.0	0.9	0.7	0.5
LCS-4-04	0-60	0.55	0.5	0.43	0.3
LCS-4-05	0-120	0.25	0.25	0.22	0.16

Current range must be chosen to suit the appropriate maximum ambient temperature. Current ratings apply for entire voltage range.

REGULATED VOLTAGE OUTPUT

Regulation (line) . . . . . 0.01 percent plus 1.0 millivolt for input variations from 105-132 or 132-105 volts AC

Regulation (load) . . . . . 0.01 percent plus 1.0 millivolt for load variations from no load to full load or full load to no load

Remote Programming

External Resistor . . . . . Nominal 1000 ohms/ volt output

Programming Voltage . . . . . One-to-one voltage change

Ripple and Noise . . . . . 250 microvolts rms; 1 millivolt peak to peak with 57-63 Hz input

Temperature Coefficient . . . . . Output change in voltage (0.01% + 0.3%mv)/°C using an external programming resistor, less than (0.015% + 0.3%mv)/°C with internal resistor

Remote Sensing . . . . . Provision is made for remote sensing to eliminate effect of power output lead resistance on DC regulation

AC INPUT--105-132, 205-265 or 187-242 ("V" option) volts AC at 47-440 Hz. Maximum input*: 125 Watts. Ratings apply for 57-63 Hz.; at 47-57 Hz input derate current 10% for each ambient remperature given in table I. For 63-440 Hz, consult factory for details of operation.

* With output loaded to full 40°C rating and input voltage 132 volts AC, 60 Hz.

OVERLOAD PROTECTION

Thermal	Thermostat, resets automatically when over terperature condition is eliminated
Electrical External..	Automatic electronic current limiting circuit, limits output current to a preset value less than 110% of 40°C current rating. Automatic current limiting protects the load and power supply when external overloads and direct shorts occur.
Internal	Fuse F1 provides protection against internal circuit failure in conjunction with over-voltage protector option

OVERVOLTAGE PROTECTION*--Model LCS-4-5-OV includes a fixed built in overvoltage protection circuit which prevents damage to the load caused by excessive power supply output voltage. Overvoltage protection range varies between 6.4 and 6.8 volts D.C.

*Not applicable to units bearing serial no. prefixes A-E.

INPUT AND OUTPUT CONNECTIONS--Terminal block on rear of chassis.

OPERATING AMBIENT TEMPERATURE RANGE AND DUTY CYCLE--Continuous duty form -20° to 71°C ambient with corresponding load current ratings for all modes of operation.

STORAGE TEMPERATURE - (non-operating) -55°C to 85°C

CONTROLS

DC output control	Voltage adjust control permits adjustment of DC output voltage via access hole located in nameplate.

PHYSICAL DATA

Size	.4-29/32" x 4-29/32" x 5-1/4"
Weight	.7 lbs. net; 8 lbs shipping wt.
Finish	.Grey, FED STD 595 No. 26081

MOUNTING - Three surfaces, each with tapped mounting holes, can be utilized for mounting this unit. All LCS-4 power supplies can be mounted with Top, Front, or Rear facing up. Top, Front, or Rear must be in a horizontal plane. Refer to figure 12 for mounting details.

MODEL OPTIONS

"V" Option . . . . . Standard LCS-4 power supplies can be obtained for 205-265 VAC, 47-440 Hz input or 187-242 VAC, 47-440 Hz input. See nameplate for AC input rating. See schematic diagram for rewiring of AC input. At 47-57 Hz input derate current 10% for each ambient temperature given in Table I. For 63-440Hz, consult factory for details of operation.

"S" Option (LCS-4-3 - LCS-4-48 Only) . . . . . Fixed voltage LCS-4 power supplies must be specified with the "S" option when used with the System Power Sequencer. On units with "S" option resistor R20 is jumped, see schematic diagram.

ACCESSORIES

Rack Adapter . . . . . Rack adapters LRA-10, LRA-11, or LRA-13 with or without chassis slides are available.

Overvoltage Protector . . . . . Externally mounted, L-20-OV series overvoltage protectors are available for use with models LCS-4-5, -6, -12, -15, -20, -24, -28. On models LCS-4-2, -3, -3P6, -4, -4P5, -8, -10, -18, -36, -48; use overvoltage protector LMOV-1, -2, -3. On models LCS-4-01 through LCS-4-04, use overvoltage protectors LHOV-4, -5, -6.

Control Panel . . . . . All LCS-4 power supplies may be obtained with a Systems Power Control Panel, SP-5. This unit, mounted on rack adapters LRA-10 or LRA-11, and used with a System Cable or Auxiliary Cable, provides an on-off switch, voltage control and pilot light.

Metering Panel . . . . . A Systems Metering Panel SMP-5 may be used in conjunction with the LCS-4 power supplies. The panel, mounted in rack adapters LRA-10 or LRA-11, and used with a Systems Cable, contains a voltmeter and an ammeter, each with three ranges and a push button selector switch. The selector switch allows monitoring of the voltage and current of any of up to 8 outputs.

Metered and Non-Metered Panels . . . . . Metered panel MP-5 and non-metered panel P-5 are available for use with Lambda rack adapter LRA-6 or LRA-7.

THEORY OF OPERATION

GENERAL

The Lambda power supply consists of an AC input circuit and transformer; a bias supply consisting of an auxiliary rectifier and filter, and pre-regulator*; a main regulator circuit consisting of the main rectifier and filter, a series regulator, emitter follower driver, a current comparator*, a voltage comparator*, an amplifier*, current and voltage sensing networks and a voltage reference circuit*.

* This circuit element is part of integrated circuit (IC1) in the supply.

The circuit arrangement is shown in block diagram form, Figure 10. The circuitry is discussed with reference to the block diagram and the schematic diagram.

FUNCTIONAL DESCRIPTION

Single phase input power is applied to transformer T1 through the input circuit which contains a thermostat to protect the supply against over heating.

The main rectifier, a full wave rectifier, provides the power which is filtered by capacitor C6 and then regulated via a series regulator and delivered to the output. Half-wave auxiliary rectifier CR1 provides voltage filtered by capacitor C1 for the preregulator located in IC1. The reference element, powered by the preregulator, provides a reference voltage for the current comparator and the voltage comparator.

Constant voltage circuit operation is determined by changes in the load which cause a change in one input to the voltage comparator. A second input to comparator is a reference voltage that is developed by a constant current of 1 milliampere flowing in divider element R8. The comparator compares the output voltage change with the reference voltage resulting in an error signal at the output of the comparator.

The error signal from the comparator is then current amplified by drivers Q1 and Q2. The amplified signal from the drivers controls the voltage across the series regulators Q3 and Q4, which function as the active regulating elements in the supply.

* Current limit circuit operation for models LCS-4-01 through LCS-4-05 is determined by changes in the load. The current comparator samples load current through current sensing resistor R7. When the voltage drop across R7 increases to the preset voltage reference is determined by R6, R9 and R13, the current comparator conducts. Thus, when the output current rating of the unit is exceeded, the current comparator conducts, decreasing the current through drivers Q1 and Q2, resulting in an increase of voltage across the series regulator and a decrease of the output voltage, effectively limiting the output current to a safe value. The current limit value is determined by fixed resistors R6, R7, R9 and variable resistor R13.

When operating conditions approach short circuit, the output voltage decreases. Since the voltage determined by R13 is proportional to the output voltage, when the output voltage decreases, the amplifier is biased into turn on at lower and lower load currents until output voltage decreases to zero and current decreases to a predetermined low value.

* The following theory applies to models LCS-4-2 through LCS-4-150.

Current limit circuit operation is determined by changes in the load. When load current increases above the rated current value, the voltage drop across current limit potentiometer R13 increases causing the amplifier to turn on. With the amplifier conducting the current to driver Q1 (or, as applicable, Q2), decreases, limiting the base current to series regulators Q3 and Q4 which results in an increase of voltage across the series regulators and a decrease of the output voltage, effectively limiting the output current to a safe value. The current limit value is determined by the factory setting of current limit potentiometer R13.

When operating conditions reach short circuit, the output voltage value decreases to zero and the current decreases to a predetermined current limit value and remains unchanged.

OV CIRCUIT, FUNCTIONAL DESCRIPTION (LCS-4-5-OV ONLY)**

When the power supply output voltage increases above the overvoltage limit (6.4 to 6.8 volts), HC1 fires causing the power supply output voltage to drop.

**Not applicable to units bearing serial no. prefixes A-E.

OPERATING INSTRUCTIONS

BASIC MODE OF OPERATION

This power supply operates as a constant voltage source provided the load current does not exceed the rated value at 40°C. For continuous operation, load current must not exceed the rating for each ambient temperature and will remain limited to less than 110% of 40°C rating.

CONNECTIONS FOR OPERATION

NOTE: Make all connections to the unit before applying AC input power.

Ground Connections. The Lambda power supply can be operated either with negative or positive output terminal grounded. Both positive and negative ground connections are shown in the diagrams for all suggested output connections illustrated in this manual.

Connection Terminals. Make all connections to the supply at the terminal block on the rear of the supply. Apply input power to terminals 1 and 2; always connect the ungrounded (hot) lead to terminal 1.

The supply positive terminal is brought out to terminal 6. The supply negative terminal is brought out to terminal 4. Recommended wiring of the power supply to the load and selection of wiring is shown in figures 1 through 9. Selection of proper wiring is made on the basis of load requirements. Make all performance checks and measurements of current or voltage at the rear output terminals. Connect measuring devices directly to terminals or use the shortest leads possible.

SUPPLY LOAD CONNECTIONS

Connections For Operation as a Constant Voltage Source

The output impedance and regulation of the power supply at the load may change when using the supply as a constant voltage source and connecting leads of practical length are used. To minimize the effect of the output leads on these characteristics, remote sensing is used. Recommended types of supply-load connections with local or remote sensing are described in the following paragraphs.

Refer to figure 1 to determine voltage drop for particular cable length, wire size and current conditions. Lead lengths must be measured from supply terminals to load terminals as shown in figure 2.

Two-Wire Connection, Figure 3. The two-wire connection, with local sensing, is the connection suitable for applications with relatively constant load.

Four-Wire Connection, Figure 4. The four-wire connection with remote sensing, provides complete compensation for the DC voltage drops in the connecting cables. Sensing leads should be a twisted pair to minimize AC pick-up. A 2.5mf, elect., capacitor may be required between output terminals and sense terminals to reduce noise pick-up.

Programmed Voltage Connections, Using External Resistor, Figure 5. Discrete voltage steps can be programmed with a resistance voltage divider valued at 1000 ohms/volt and a shorting-type switch as shown in Figure 5. When continuous voltage variations are required, use a variable resistor with the same 1000 ohms/volt ratio in place of the resistive voltage divider and shorting-type switch. Use a low temperature coefficient resistor to assure most stable operation.

Before programming, adjust programming resistor for zero resistance and set voltage adjust control to the minimum rated output voltage.

As shown in figure 5, voltages can be programmed utilizing either local or remote sensing connections, as desired.

Programmed Voltage Connections Using Programming Voltage, Figure 6. The power supply voltage output can be programmed with an externally connected programming power supply. The output voltage of the programmed supply will maintain a one-to-one ratio with the voltage of the programming supply if the output voltage control of the programmed supply is set to minimum output voltage.

The programming supply must have a reverse current capability of 1.5 ma. minimum.

Alternatively, when supplies with less than 1.5 ma reverse current capability are used, a resistor capable of drawing 1.5 ma at the minimum programming voltage must be connected across the output terminals of the supply. This programming supply must be rated to handle all excess resistor current at the maximum programming voltage.

Connections For Series Operation

The voltage capability of LCS-4 power supplies can be extended by series operation. A maximum of 300 volts can be connected between either the +DC or -DC terminal and chassis ground with a maximum voltage capability of 300 volts possible for model LCS-4-150.

Figure 7, and as applicable, 7A, shows the connections for either local or remote sensing in a series connection where the voltage control of each unit functions independently to control the output.

Figure 7 applies only to the LCS-4-01 through LCS-4-05 power supplies. If a common load is used, the maximum current rating of the unit with the lower current rating must not be exceeded.

Figure 7A shows the series connection applicable to the LCS-4-2 through LCS-4-150 power supplies. A diode, having a current carrying capability equal to or greater than the maximum current rating of the supply, must be used and connected as shown in figure 7A. The diode blocking voltage should be at least twice the maximum rated output voltage of the supply. See table I, of "Specifications and Features", for power supply current and voltage ratings.

Connections For Parallel Operation (Applicable only to LCS-4-01——LCS-4-05)

The current capability of LCS-4 power supplies can be extended by parallel operation of LCS-4 power supplies of equal* voltage capacities. Units "M" and "S" are shown connected for parallel operation in figures 8 and 9. One power supply designated the "M" unit controls its own output as well as the output of the second power supply, designated the "S" unit.

* For applications using supplies of unequal voltage ratings, consult factory for details of operation.

Unit S operates to regulate its current in a ratio to that of the M unit by comparing the current in its internal sampling resistor with that current sampled by the master internal sampling resistor.

CAUTION: Always set "S" unit voltage control to zero (fully CCW) during parallel operation, otherwise excessive current will flow through "M" unit voltage control.

OPERATION AFTER PROTECTIVE DEVICE SHUTDOWN

Thermostat Shutdown

The thermostat opens the input circuit only when the temperature of the internal heat sink exceeds a maximum safe value. The thermostat will automatically reset when the temperature of the heat sink decreases to a safe operating value. After eliminating the cause(s) for overheating and allowing time for the power supply to cool to a proper temperature, resume operation of the supply.

Fuse Shutdown

Fuses will blow when the maximum rated current value for the fuse is exceeded. Fatigue failure of fuses can occur when mechanical vibrations from the installation combine with thermally induced stresses to weaken the fuse metal. Many fuse failures are caused by a temporary condition and replacing the blown fuse will make the fuse protected circuit operative. When the LCS-4 supply is used with the overvoltage protector option fuse F1 will provide load protection against internal component failure.

Overvoltage Shutdown (LCS-4-5-OV ONLY)*

When the power supply output voltage increases above the overvoltage limit, HC1 will short circuit output of the supply. After eliminating the cause(s) for overvoltage, resume operation of the supply by momentarily interrupting the AC input circuit.

*Not applicable to units bearing serial no. prefixes A-E.

GENERAL

This section describes trouble analysis routine, replacement procedures, calibration and test procedures that are useful for servicing the Lambda LCS-4 power supply. A trouble chart is provided as an aid for the troubleshooter. Refer to the section on specifications and features for the minimum performance standards.

TROUBLE ANALYSIS

Whenever trouble occurs, systematically check fuse, primary power lines, external circuit elements, and external wiring for malfunction before trouble shooting the equipment. Failures and malfunctions often can be traced to simple causes such as improper jumper and supply-load connections or fuse failure due to metal fatigue.

Use the electrical schematic diagram and block diagram, figure 11, as an aid to locating trouble causes. The schematic diagram contains various circuit voltages that are averages for normal operation. Measure these voltages using the conditions for measurement specified on the schematic diagram. Use measuring probes carefully to avoid causing short circuits and damaging circuit components.

CHECKING TRANSISTORS AND CAPACITORS

Check transistors with an instrument that has a highly limited current capability. Observe proper polarity to avoid error in measurement. The forward transistor resistance is low but never zero; backward resistance is always higher than the forward resistance.

For good transistors, the forward resistance for any junction is <u>always</u> greater than zero.

Do not assume trouble is eliminated when only one part is replaced. This is especially true when one transistor fails, causing other transistors to fail. Replacing only one transistor and turning power on, before checking for additional defective components could damage the replaced component.

When soldering semi-conductor devices, wherever possible, hold the lead being soldered with a pair of pliers placed between the component and the solder joint to provide an effective heat sink.

> <u>NOTE</u>: The leakage resistance obtained from a simple resistance check of a capacitor is not always an indication of a faulty capacitor. In all cases the capacitors are shunted with resistances, some of which have low values. Only a dead short is a true indication of a shorted capacitor.

PRINTED CIRCUIT BOARD MAINTENANCE TECHNIQUES

1. If foil is intact but not covered with solder, it is a good contact. Do not attempt to cover with solder.

2. Voltage measurements can be made from either side of the board. Use a needlepoint probe to penetrate to the wiring whenever a protective coating is used

on the wiring. A brass probe can be soldered to an alligator clip adapted to the measuring instrument.

3. Wherever possible use a heat sink when soldering transistors.

4. Broken or damaged printed wiring is usually the result of an imperfection, strain or careless soldering. To repair small breaks, tin a short piece of hook-up wire to bridge the break, and holding the wire in place, flow solder along the length of wire so that it becomes part of the circuitry.

5. When unsoldering components from the board never pry or force loose the part; unsolder the component by using the wicking process described below:

(a) Select a 3/16 inch tinned copper braid for use as a wick; if braid is not available, select AWG No. 14 or No. 16 stranded wire with 1/2 inch insulation removed.

(b) Dip the wick in liquid rosin flux.

(c) Place the wick onto the soldered connection and apply soldering iron onto the wick.

(d) When sufficient amount of solder flows onto the wick, freeing the component, simultaneously remove iron and wick.

TROUBLE CHART

The trouble chart is intended as a guide for locating trouble causes, and is used along with the schematic diagram.

The operating conditions assumed for the trouble chart are as follows:

(a) AC power of proper voltage and frequency is preset at input terminals.

(b) Either positive or negative terminal is connected to chassis ground.

(c) The power supply is connected for constant voltage with local sensing. See schematic; dotted lines indicate jumpers connected for local sensing operation.

TROUBLE SHOOTING CHART

Symptom	Probable Cause	Remedy
1. Zero volts DC output	OUTPUT VOLTAGE control turned fully CCW	Check OUTPUT VOLTAGE control for proper setting and correct as necessary
	Short circuit across output of supply	Check load and load connections, correct as necessary

TROUBLE SHOOTING CHART (Cont'd)

Symptom	Probable Cause	Remedy
1. Zero volts DC output (Cont'd.)	F1 open	Replace F1; if it blows immediately, check shorted diode CR7, transistors Q1, Q2, Q3 and Q4 and capacitor C7; replace as necessary
	Series regulator section open	Check Q1, and, Q2 for open, replace as necessary
	Shorted CR6 or CR7 (as applicable)	Check CR6 or CR7 for open, replace as necessary
	Current sensing resistor open	Check R7 for open, R6 for short
	Aux. rectifier CR1 open	Check CR1 for open; replace as necessary
	Open CR8, CR9 or R1	Check and replace as necessary
2. Unable to adjust output voltage	Damaged OUTPUT VOLTAGE control	Check R8 for short and/or open, replace as necessary
3. High ripple at line frequency or twice line frequency and unregulated DC output	Series regulator transistors shorted	Check and replace as necessary; Q1, Q2, Q3, Q4
	Defective main rectifier causes ripple at twice line frequency	Check for open and/or short CR2, CR3, CR4 and CR5, or, as applicable, CR14 and CR15
4. Same as 3, except intermittent	Foreign matter fallen into unit	Check for loose bench hardware and wire clippings that may have fallen through cover
5. High ripple at frequency other than line or twice line frequency	Oscillation due to defective component in filter network	Check for open C7, C2 and check for open and/or short in C11 and R2. Replace defective component
6. Large spikes at output	Capacitor C5, or as applicable, C4 and C14, open	Replace C5 (or C4 and C14)

PERFORMANCE CHECKS

Check the ripple and regulation of the power supply using the test connection diagram shown in figure 11. Use suggested test equipment or equivalent to obtain accurate results. Refer to SPECIFICATIONS AND FEATURES for minimum performance standards.

Set the differential meter, DC VTVM (John Fluke Model 801H or equivalent) to the selected power supply operating voltage. Check the power supply load regulation accuracy while switching from the load to no-load condition. Long load leads should be a twisted pair to minimize AC pick-up.

Use a Variac to vary the line voltage from 105-132 or 132-105 volts AC and check the power-supply line regulation accuracy on the VTVM differential meter.

Use a VTVM, Ballantine 320 or equivalent, to measure rms ripple voltage of the power supply DC output. Use oscilloscope to measure peak-to-peak ripple voltage of the power supply DC output.

ADJUSTMENT OF CALIBRATION CONTROL R13

Whenever Q3, Q4, R6, R7, R9, R11, R13, R21 or IC1 are replaced, and voltage and current indications do not reflect maximum ratings, adjust R13 as follows. The adjustment procedure requires that the power supply is removed from associated equipment, is at an ambient temperature of 25-30°C, and is stabilized and not operating.

1. Remove AC input power to the supply.

2. Break seal on wiper of R13 from resistor housing and turn to full CW position.

3. Operate power supply for constant voltage with local sensing, connected as shown in figure 3, with no external load.

4.* Turn voltage adjust control until minimum rated output voltage is obtained.

5.* Apply load so that output current is 110% of 40°C rating for the unit.

6.* Using an oscilloscope, Tektronix 503 or equivalent, observe output voltage while adjusting R13 in CCW direction. Adjust R13 until output ripple begins to increase.

7.* Turn voltage adjust control until maximum rated output voltage is obtained.

8.* Increase load. Maximum attainable load current shall not exceed 130% of 40°C rating for the unit.

9.* After adjustment is completed, remove AC power input to the supply and use glyptol sealant to seal wiper of R13 to resistor housing.

10.* After sealing, check setting and repeat adjustment procedure if required.

* Perform alternate steps 4A through 9A for adjustment of R13 on models LCS-4-01 through LCS-4-05.

4A. Turn voltage adjust control until rated output voltage is obtained.

5A. Apply load so that output current is 110% of 40°C rating for the unit.

6A. Using an oscilloscope, Tektronix 503 or equivalent, observe unit output voltage while adjusting R13 in a CCW direction. Adjust R13 until output ripple increases sharply and oscilloscope pattern changes.

7A. Place a DC ammeter of appropriate scale across output terminals 4 and 6 of the supply. The meter indication shall be a maximum of 115% of 40°C rating for the unit.

8A. After adjustment is completed, remove AC input power to the supply and use glyptol sealant to seal wiper of R13 to resistor housing.

9A. After sealing, check setting and repeat adjustment procedure if required.

SERVICE

When additional instructions are required or repair service is desired, contact the nearest Lambda office where trained personnel and complete facilities are ready to assist you.

Please include the power supply model and serial number together with complete details of the problem. On receipt of this information, Lambda will supply service data or advise shipping for factory repair service.

All repairs not covered by the warranty will be billed at cost and an estimate forwarded for approval before work is started.

PARTS ORDERING

Standard components and special components used in the Lambda power supply can be obtained from the factory. In case of emergency, critical spare parts are available through any Lambda office.

The following information must be included when ordering parts:

1. Model number and serial number of power supply and purchase date.

2. Lambda part number.

3. Description of part together with circuit designation.

4. If part is not an electronic part, or is not listed, provide a description, function, and location of the part.

The electrical parts located on Lambda models LCS-4-2—LCS-4-150 and LCS-4-01—LCS-4-05 are listed here. Common parts to a group of models are listed first. Unique parts of individual models within the group are listed separately, by model, immediately following the group common-parts listing. In addition there are separate listings of parts for the "V" option and SP-3, SP-5, SMP-3, SMP-5, LMOV, LHOV, MP-5, and P-5 accessories.

COMMON PARTS
MODELS LCS-4-2—LCS-4-48

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
C1	Cap., elec., 40 mf -10 +75%, 25 vdc	CBP-40-036
C2	Cap., mylar 0.047 mf ±10%, 200 vdc	CGL-47-018
C3	Not assigned	
C9	Cap., mylar, 1 mf ±10%, 200 vdc	CGN-10-005
C10	Cap., mylar, 0.033 mf ±10%, 400 vdc	CGL-33-009
C11	Cap., mylar 0.0047 mf ±10%, 200 vdc	CGK-47-002
C12, C13, C15	Not assigned	
C16	Cap., mylar, 0.1 mf ±10%, 200 vdc	CAM-10-012
CR1	Rectifier	FBL-00-030
CR6, CR7, CR9	Not assigned	
CR10, CR11	Same as CR1	
CR12	Not assigned	
CR13	Same as CR1	
CR16 thru CR21	Not assigned	
CR22**	Rectifier, zener diode	FBM-Z139
IC1*	Integrated Circuit	FBT-00-031
R1*	Res., film, 8,660 ohms ±1%, ¼ w	DCS-87-071
R6	Res., comp., 47 ohms ±10%, ¼ w	DCB-4701
R9	Res., film, 10,000 ohms ±1%, ¼ w	DCT-10-047
R10†	Res., comp., 36 megohms ±5%, ¼ w	DCB-3665
R12	Res., comp., 68,000 ohms ±10%, ¼ w	DCB-6831
R13	Res., var., ww, 5,000 ohms ±10%, 1½ w	DNS-50-086
R15	Not assigned	
R16	Res., comp., 470 ohms ±10%, ¼ w	DCB-4711
R17 thru R19, R22	Not assigned	
R23	Res., comp., 4,700 ohms ±10%, ¼ w	DCB-4721
S1	Thermostat	FKA-137-014
XF1	Fuseholder	HRM-00-016

COMMON PARTS (Cont.)
MODELS LCS-4-2—LCS-4-48 (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.

* On units with serial no. prefix A, IC1 is FBT-00-002 and R1 is 9,100 ohms ±2%, DCS-91-050.
On units with serial no. prefix B, IC1 is FBT-00-010.

† On units with serial no. prefixes A & B, R 10 is 68 megohms ±10%, DCB-6861.

** CR22 not used on units with serial no. prefixes A-D.

UNIQUE PARTS
MODEL LCS-4-2

C4	Cap., mylar, 0.22 mf ±10%, 200 vdc	CGM-22-002
C5	Not assigned	
C6	Cap., elect., 7,500 mf -10 +100%, 15 vdc	CBS-75-077
C7	Cap., elect., 450 mf -10 +100%, 25 vdc	CBR-45-075
C8	Not assigned	
C14	Same as C4	
CR2 thru CR5	Not assigned	
CR8	Rectifier	FBL-00-030
CR14, CR15	Rectifier	FBL-00-054
F1	Fuse, 10A, 8 AG, NORM-BLO	FFR-10-000
Q1, Q2	Transistor, NPN	FBN-L113
Q3, Q4	Transistor, NPN	FBN-36485
R2	Res., comp., 150 ohms ±10%, ¼ w	DCB-1511
R3	Res., comp., 10,000 ohms ±10%, 1 w	DGB-1031
R4	Res., comp., 1,000 ohms ±10%, ½ w	DEB-1021
R5	Res., comp., 1,200 ohms ±10%, ¼ w	DCB-1221
R7	Res., ww, 0.25 ohm ±5%, 5 w	DFM-25-016
R8	Res., var., ww or cermet, 2,000 ohms ±10%, ¾ w	DNS-20-034
R11	Same as R7	
R14	Not assigned	
R20	Res., film, 1,600 ohms ±5%, ½ w	DCS-16-015
R21	Res., film, 10,000 ohms ±5%, ½ w	DCT-10-008
T1	Transformer	ABA-CS4-2

UNIQUE PARTS (Cont.)

MODEL LCS-4-3

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
C4	Cap., mylar, 0.22 mf ±10%, 200 vdc	CGM-22-002
C5	Not assigned	
C6	Cap., elect., 7,500 mf -10 +100%, 15 vdc	CBS-75-077
C7	Cap., elect., 450 mf -10 + 100%, 25 vdc	CBR-45-075
C8	Not assigned	
C14	Same as C4	
CR2 thru CR5	Not assigned	
CR8	Rectifier	FBL-00-030
CR14, CR15	Rectifier	FBL-00-054
F1	Fuse, 10 amp 8 AG, NORM-BLO	FFR-10-000
Q1, Q2	Transistor, NPN	FBN-L113
Q3, Q4	Transistor, NPN	FBN-36485
R2	Res., comp., 150 ohms ±10%, ¼ w	DCB-1511
R3	Res., comp., 10,000 ohms ±10%, 1 w	DGB-1031
R4	Res., comp., 2,200 ohms ±10%, ½ w	DEB-2221
R5	Res., comp., 1,200 ohms ±10%, ¼ w	DCB-1221
R7	Res., ww, 0.25 ohm ±5%, 5 w	DFM-25-016
R8	Res., var., ww or cermet, 5,000 ohms ±10%, ¾ w	DNS-50-036
R11	Same as R7	
R14	Not assigned	
R20	Res., film, 2,700 ohms ±5%, ½ w	DCS-27-020
R21	Res., film, 15,000 ohms ±2%, ½ w	DCT-15-013
T1	Transformer	ABA-CS4-3

MODEL LCS-4-3P6

C4	Cap., mylar, 0.22 mf ±10%, 200 vdc	CGM-22-002
C5	Not assigned	
C6	Cap., elect., 7,500 mf -10 +100%, 15 vdc	CBS-75-077
C7	Cap., elect., 450 mf -10 +100%, 25 vdc	CBR-45-075
C8	Not assigned	
C14	Same as C4	
CR2 thru CR5	Not assigned	
CR8	Rectifier	FBL-00-030
CR14, CR15	Rectifier	FBL-00-054
F1	Fuse, 10 amp, 8 AG, NORM-BLO	FFR-10-000

UNIQUE PARTS (Cont.)

MODELS LCS-4-3P6 (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
Q1, Q2	Transistor, NPN	FBN-L113
Q3, Q4	Transistor, NPN	FBN-36485
R2	Res., comp., 150 ohms ±10%, ¼ w	DCB-1511
R3	Res., comp., 10,000 ohms ±10%, 1 w	DGB-1031
R4	Res., comp., 2,200 ohms ±10%, ½ w	DEB-2221
R5	Res., comp., 1,200 ohms ±10%, ¼ w	DCB-1221
R7	Res., ww, 0.25 ohm ±5%, 5 w	DFM-25-016
R8	Res., var., ww or cermet, 5,000 ohms ±10%, ¾ w	DNS-50-036
R11	Same as R7	
R14	Not assigned	
R20	Res., film, 2,700 ohms ±5%, ½ w	DCS-27-020
R21	Res., film, 15,000 ohms ±2%, ½ w	DCT-15-013
T1	Transformer	ABA-CS4-4

MODEL LCS-4-4

C4	Cap., mylar, 0.22 mf ±10%, 200 vdc	CGM-22-002
C5	Not assigned	
C6	Cap., elect., 7,500 mf -10 +100%, 15 vdc	CBS-75-077
C7	Cap., elect., 450 mf -10 +100%, 25 vdc	CBR-45-075
C8	Not assigned	CGK-10-004
C14	Same as C4	
CR2 thru CR5	Not assigned	
CR8	Rectifier	FBL-00-030
CR14, CR15	Rectifier	FBL-00-054
F1	Fuse, 10 amp, 8 AG, NORM-BLO	FFR-10-000
Q1, Q2	Transistor, NPN	FBN-L113
Q3, Q4	Transistor, NPN	FBN-36485
R2	Res., comp., 150 ohms ±10%, ¼ w	DCB-1511
R3	Res., comp., 10,000 ohms ±10%, 1 w	DGB-1031
R4	Res., comp., 2,200 ohms ±10%, ½ w	DEB-2221
R5	Res., comp., 1,200 ohms ±10%, ¼ w	DCB-1221
R7	Res., ww, 0.25 ohm ±5%, 5 w	DFM-25-016
R8	Res., var., ww or cermet, 5,000 ohms ±10%, ¾ w	DNS-50-036
R11	Same as R7	
R14	Not assigned	DCB-2701

UNIQUE PARTS (Cont.)

MODEL LCS-4-4 (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
R20	Res., film, 2,700 ohms ±5%, ½ w	DCS-27-020
R21	Res., film, 15,000 ohms ±2%, ½ w	DCT-15-013
T1	Transformer	ABA-CS4-4

MODEL LCS-4-4P5

C4	Cap., mylar, 0.22 mf ±10%, 200 vdc	CGM-22-002
C5	Not assigned	
C6	Cap., elect., 7,500 mf -10 +100%, 15 vdc	CBS-75-077
C7	Cap., elect., 450 mf -10 +100%, 25 vdc	CBR-45-075
C8	Not assigned	
C14	Same as C4	
CR2 thru CR5	Not assigned	
CR8	Rectifier	FBL-00-030
CR14, CR15	Rectifier	FBL-00-054
F1	Fuse, 10 amp, 8 AG, NORM-BLO	FFR-10-000
Q1, Q2	Transistor, NPN	FBN-L113
Q3, Q4	Transistor, NPN	FBN-36485
R2	Res., comp., 150 ohms ±10%, ¼ w	DCB-1511
R3	Res., comp., 10,000 ohms ±10%, 1 w	DGB-1031
R4	Res., comp., 2,200 ohms ±10%, ½ w	DEB-2221
R5	Res., comp., 1,200 ohms ±10%, ¼ w	DCB-1221
R7	Res., ww, 0.25 ohm ±5%, 5 w	DFM-25-016
R8	Res., var., ww or cermet, 5,000 ohms ±10%, ¾ w	DNS-50-036
R11	Same as R7	
R14	Not assigned	
R20	Res., film, 3,600 ohms ±5%, ½ w	DCS-36-017
R21	Res., film, 22,000 ohms ±5%, ½ w	DCT-22-037
T1	Transformer	ABA-CS4-5

MODEL LCS-4-5

C4	Cap., mylar, 0.22 mf ±10%, 200 vdc	CGM-22-002
C5	Not assigned	
C6	Cap., elect., 7,500 mf -10 +100%, 15 vdc	CBS-75-077
C7	Cap., elect., 450 mf -10 +100%, 25 vdc	CBR-45-075
C8	Not assigned	
C14	Same as C4	

UNIQUE PARTS (Cont.)

MODEL LCS-4-5 (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
CR2 thru CR5	Not assigned	
CR8	Rectifier	FBL-00-030
CR14, CR15	Rectifier	FBL-00-054
F1	Fuse, 10 amp, 8 AG, NORM-BLO	FFR-10-000
HC1*	Hybrid circuit	L-12-OV-5
Q1, Q2	Transistor, NPN	FBN-L113
Q3, Q4	Transistor, NPN	FBN-36485
R2	Res., comp., 150 ohms ±10%, ¼ w	DCB-1511
R3	Res., comp., 10,000 ohms ±10%, 1 w	DGB-1031
R4	Res., comp., 3,900 ohms ±10%, ½ w	DEB-3921
R5	Res., comp., 1,200 ohms ±10%, ¼ w	DCB-1221
R7	Res., ww, 0.25 ohm ±5%, 5 w	DFM-25-016
R8	Res., var., ww or cermet, 5,000 ohms ±10%, ¾ w	DNS-50-036
R11	Same as R7	
R14	Not assigned	
R20	Res., film, 3,600 ohms ±5%, ½ w	DCS-36-017
R21	Res., film, 22,000 ohms ±5%, ½ w	DCT-22-037
T1	Transformer	ABA-CS4-5

* HC1 only used on model LCS-4-5-OV. HC1 not used on units with serial no. prefixes A-E.

MODEL LCS-4-6

C4	Cap., mylar, 0.22 mf ±10%, 200 vdc	CGM-22-002
C5	Not assigned	
C6	Cap., elect., 4,800 mf -10 +100%, 20 vdc	CBS-48-076
C7	Cap., elect., 450 mf -10 +100%, 25 vdc	CBR-45-075
C8	Not assigned	
C14	Same as C4	
CR2 thru CR5	Not assigned	
CR8	Rectifier	FBL-00-030
CR14, CR15	Rectifier	FBL-00-054
F1	Fuse, 10 amp, 8 AG, NORM-BLO	FFR-10-000
Q1, Q2	Transistor, NPN	FBN-L113
Q3, Q4	Transistor, NPN	FBN-36485
R2	Res., comp., 150 ohms ±10%, ¼ w	DCB-1511
R3	Res., comp., 10,000 ohms ±10%, 1 w	DGB-1031
R4	Res., comp., 3,900 ohms ±10%, ½ w	DEB-3921

UNIQUE PARTS (Cont.)

MODEL LCS-4-6 (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
R5	Res., comp., 1,200 ohms ±10%, ¼ w	DCB-1221
R7	Res., ww, 0.25 ohm ±5%, 5 w	DFM-25-016
R8	Res., var., ww or cermet, 5,000 ohms ±10%, ¾ w	DNS-50-036
R11	Same as R7	
R14	Not assigned	
R20	Res., film, 3,600 ohms ±5%, ½ w	DCS-36-017
R21	Res., film, 22,000 ohms ±5%, ½ w	DCT-22-037
T1	Transformer	ABA-CS4-6

MODEL LCS-4-8

C4	Cap., mylar, 0.22 mf ±10%, 200 vdc	CGM-22-002
C5	Not assigned	
C6	Cap., elect., 4,800 mf -10 +100%, 20 vdc	CBS-48-076
C7	Cap., elect., 450 mf -10 +100%, 25 vdc	CBR-45-075
C8	Not assigned	
C14	Same as C4	
CR2 thru CR5	Not assigned	
CR8	Rectifier	FBL-00-030
CR14, CR15	Rectifier	FBL-00-054
F1	Fuse, 10 amp, 8 AG, NORM-BLO	FFR-10-000
Q1, Q2	Transistor, NPN	FBN-L113
Q3, Q4	Transistor, NPN	FBN-36485
R2	Res., comp., 150 ohms ±10%, ¼ w	DCB-1511
R3	Res., comp., 10,000 ohms ±10%, 1 w	DGB-1031
R4	Res., comp., 3,900 ohms ±10%, ½ w	DEB-3921
R5	Res., comp., 1,200 ohms ±10%, ¼ w	DCB-1221
R7	Res., ww, 0.25 ohm ±5%, 5 w	DFM-25-016
R8	Res., var., ww or cermet, 5,000 ohms ±10%, ¾ w	DNS-50-036
R11	Same as R7	
R14	Not assigned	
R20	Res., film, 6,800 ohms ±5%, ½ w	DCS-68-021
R21	Res., film, 39,000 ohms ±5%, ½ w	DCT-39-015
T1	Transformer	ABA-CS4-8

UNIQUE PARTS (Cont.)

MODEL LCS-4-10

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
C4	Cap., mylar, 0.22 mf ±10%, 200 vdc	CGM-22-002
C5	Not assigned	
C6	Cap., elect., 2,500 mf -10 +100%, 40 vdc	CBS-25-075
C7	Cap., elect., 450 mf -10 +100%, 25 vdc	CBR-45-075
C8	Not assigned	
C14	Same as C4	
CR2 thru CR5	Not assigned	
CR8	Rectifier	FBL-00-030
CR14, CR15	Rectifier	FBL-00-054
F1	Fuse, 10 amp, 8 AG, NORM-BLO	FFR-10-000
Q1, Q2	Transistor, NPN	FBN-L113
Q3, Q4	Transistor, NPN	FBN-36485
R2	Res., comp., 150 ohms ±10%, ¼ w	DCB-1511
R3	Res., comp., 10,000 ohms ±10%, 1 w	DGB-1031
R4	Res., comp., 3,900 ohms ±10%, ½ w	DEB-3921
R5	Not assigned	
R7	Res., ww, 0.25 ohm ±5%, 5 w	DFM-25-016
R8	Res., var., ww or cermet, 5,000 ohms ±10%, ¾ w	DNS-50-036
R11	Same as R7	
R14	Not assigned	
R20	Res., film, 8,200 ohms ±5%, ½ w	DCS-82-026
R21	Res., film, 39,000 ohms ±5%, ½ w	DCT-39-015
T1	Transformer	ABA-CS4-10

MODEL LCS-4-12

C4	Not assigned	
C5	Cap., mylar, 0.22 mf ±10%, 200 vdc	CGM-22-002
C6	Cap., elect., 2,500 mf -10 +100%, 40 vdc	CBS-25-075
C7	Cap., elect., 450 mf -10 +100%, 25 vdc	CBR-45-075
C8	Not assigned	
C14	Not assigned	
CR2 thru CR5	Rectifier	FBL-00-054
CR8	Rectifier	FBL-00-030
CR14, CR15	Not assigned	
F1	Fuse, 6 amp, 8 AG NORM-BLO	FFR-06-000

UNIQUE PARTS (Cont.)

MODEL LCS-4-12 (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
Q1, Q2	Transistor, NPN	FBN-L113
Q3, Q4	Transistor, NPN	FBN-36485
R2	Res., comp., 150 ohms ±10%, ¼ w	DCB-1511
R3	Res., comp., 10,000 ohms ±10%, 1 w	DGB-1031
R4	Res., comp., 8,200 ohms ±10%, ½ w	DEB-8221
R5	Res., comp., 1,200 ohms ±10%, ¼ w	DCB-1221
R7	Res., ww, 0.5 ohm ±5%, 5 w	DFM-50-015
R8	Res., var, ww or cermet, 20,000 ohms ±10%, ¾ w	DNT-20-010
R11	Same as R7	
R14	Not assigned	
R20	Res., film, 9,100 ohms ±5%, ½ w	DCS-91-025
R21	Res., film, 68,000 ohms ±2%, ½ w	DCT-68-012
T1	Transformer	ABA-CS4-12

MODEL LCS-4-15

C4	Not assigned	
C5	Cap., mylar, 0.22 mf ±10%. 200 vdc	CGM-22-002
C6	Cap., elect., 2,500 mf -10 +100%, 40 vdc	CBS-25-075
C7	Cap., elect., 280 mf -10 +100%, 40 vdc	CBR-28-074
C8	Not assigned	
C14	Not assigned	
CR2 thru CR5	Rectifier	FBL-00-054
CR8	Rectifier	FBL-00-030
CR14, CR15	Not assigned	
F1	Fuse, 6 amp, 8 AG NORM-BLO	FFR-06-000
Q1, Q2	Transistor, NPN	FBN-L113
Q3, Q4	Transistor, NPN	FBN-36485
R2	Res., comp., 150 ohms ±10%, ¼ w	DCB-1511
R3	Res., comp., 10,000 ohms ±10%, 1 w	DGB-1031
R4	Res., comp., 8,200 ohms ±10%, ½ w	DEB-8221
R5	Res., comp., 1,200 ohms ±10%, ¼ w	DCB-1221
R7	Res, ww, 0.5 ohm ±5%, 5 w	DFM-50-015
R8	Res., var., ww or cermet, 20,000 ohms ±10%, ¾ w	DNT-20-010
R11	Same as R7	
R14	Not assigned	
R20	Res., film, 9,100 ohms ±5%, ½ w	DCS-91-025

UNIQUE PARTS (Cont.)

MODEL LCS-4-15 (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
R21	Res., film, 68,000 ohms ±2%, ½ w	DCT-68-012
T1	Transformer	ABA-CS4-15

MODEL LCS-4-18

C4	Not assigned	
C5	Cap., mylar, 0.22 mf ±10%, 200 vdc	CGM-22-002
C6	Cap., elect., 2,500 mf -10 +100%, 40 vdc	CBS-25-075
C7	Cap., elect., 280 mf -10 +100%, 40 vdc	CBR-28-074
C8	Not assigned	
C14	Not assigned	
CR2 thru CR5	Rectifier	FBL-00-054
CR8	Rectifier	FBL-00-030
CR14, CR15	Not assigned	
F1	Fuse, 6 amp, 8 AG, NORM-BLO	FFR-06-000
Q1, Q2	Transistor, NPN	FBN-L109
Q3, Q4	Transistor, NPN	FBN-36220
R2	Res., comp., 220 ohms ±10%, ¼ w	DCB-2211
R3	Res., comp., 10,000 ohms ±10%, 1 w	DGB-1031
R4	Res., comp., 8,200 ohms ±10%, ½ w	DEB-8221
R5	Res., comp., 1,200 ohms ±10%, ¼ w	DCB-1221
R7	Res., ww, 0.5 ohm ±5%, 5 w	DFM-50-015
R8	Res., var., ww or cermet, 20,000 ohms ±10%, ¾ w	DNT-20-010
R11	Same as R7	
R14	Not assigned	
R20	Res., film, 15,000 ohms ±2%, ½ w	DCT-15-013
R21	Res., film, 100,000 ohms ±1%, ¼ w	DCV-10-027
T1	Transformer	ABA-CS4-18

MODEL LCS-4-20

C4	Not assigned	
C5	Cap., mylar, 0.22 mf ±10%, 200 vdc	CGM-22-002
C6	Cap., elect., 2,500 mf -10 +100%, 40 vdc	CBS-25-075
C7	Cap., elect., 280 mf -10 +100%, 40 vdc	CBR-28-074
C8	Not assigned	
C14	Not assigned	
CR2 thru CR5	Rectifier	FBL-00-054
CR8	Rectifier	FBL-00-030

UNIQUE PARTS (Cont.)

MODEL LCS-4-20 (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
CR14, CR15	Not assigned	
F1	Fuse, 5 amp, 8 AG, NORM-BLO	FFR-05-000
Q1, Q2	Transistor, NPN	FBN-L109
Q3, Q4	Transistor, NPN	FBN-36220
R2	Res., comp., 220 ohms ±10%, ¼ w	DCB-2211
R3	Res., comp., 10,000 ohms ±10%, 1 w	DGB-1031
R4	Res., comp., 8,200 ohms ±10%, ½ w	DEB-8221
R5	Res., comp., 1,200 ohms ±10%, ¼ w	DCB-1221
R7	Res., ww, 0.5 ohm ±5%, 5 w	DFM-50-015
R8	Res., var., ww or cermet, 20,000 ohms ±10%, ¾ w	DNT-20-010
R11	Same as R7	
R14	Not assigned	
R20	Res., film, 15,000 ohms ±2%, ½ w	DCT-15-013
R21	Res., film, 100,000 ohms ±1%, ¼ w	DCV-10-027
T1	Transformer	ABA-CS4-20

MODEL LCS-4-24

C4	Not assigned	
C5	Cap., mylar, 0.22 mf ±10%, 200 vdc	CGM-22-002
C6	Cap., elect., 1,600 mf -10 +100%, 60 vdc	CBS-16-074
C7	Cap., elect., 175 mf -10 +100%, 50 vdc	CBR-17-073
C8	Not assigned	
C14	Not assigned	
CR2 thru CR5	Rectifier	FBL-00-054
CR8	Rectifier	FBL-00-030
CR14, CR15	Not assigned	
F1	Fuse, 5 amp, 8 AG, NORM-BLO	FFR-05-000
Q1, Q2	Transistor, NPN	FBN-L109
Q3, Q4	Transistor, NPN	FBN-36220
R2	Res., comp., 220 ohms ±10%, ¼ w	DCB-2211
R3	Res., comp., 10,000 ohms ±10%, 1 w	DGB-1031
R4	Res., comp., 18,000 ohms ±10%, ½ w	DEB-1831

UNIQUE PARTS (Cont.)

MODEL LCS-4-24 (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
R5	Res., comp., 1,200 ohms ±10%, ¼ w	DCB-1221
R7	Res., ww, 0.5 ohm ±5%, 5 w	DFM-50-015
R8	Res., var., ww or cermet, 20,000 ohms ±10%, ¾ w	DNT-20-010
R11	Same as R7	
R14	Not assigned	
R20	Res., film, 15,000 ohms ±2%, ½ w	DCT-15-013
R21	Res., film, 100,000 ohms ±1%, ¼ w	DCV-10-027
T1	Transformer	ABA-CS4-24

MODEL LCS-4-28

C4	Not assigned	
C5	Cap., mylar, 0.22 mf ±10%, 200 vdc	CGM-22-002
C6	Cap., elect., 1,600 mf -10 +100%, 60 vdc	CBS-16-074
C7	Cap., elect., 175 mf -10 +100%, 50 vdc	CBR-17-073
C8	Not assigned	
C14	Not assigned	
CR2 thru CR5	Rectifier	FBL-00-054
CR8	Rectifier	FBL-00-030
CR14, CR15	Not assigned	
F1	Fuse, 5 amp, 8 AG, NORM-BLO	FFR-05-000
Q1, Q2	Transistor, NPN	FBN-L109
Q3, Q4	Transistor, NPN	FBN-36220
R2	Res., comp., 220 ohms ±10%, ¼ w	DCB-2211
R3	Res., comp., 10,000 ohms ±10%, 1 w	DGB-1031
R4	Res., comp., 18,000 ohms ±10%, ½ w	DEB-1831
R5	Res., comp., 1,200 ohms ±10%, ¼ w	DCB-1221
R7	Res., ww, 0.5 ohm ±5%, 5 w	DFM-50-015
R8	Res., var., ww or cermet, 20,000 ohms ±10%, ¾ w	DNT-20-010
R11	Same as R7	
R14	Not assigned	
R20	Res., film, 24,000 ohms ±5%, ½ w	DCT-24-031
R21	Res., film, 120,000 ohms ±1%, ½ w	DCV-12-019
T1	Transformer	ABA-CS4-28

UNIQUE PARTS (Cont.)

MODEL LCS-4-36

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
C4	Not assigned	
C5	Cap., mylar, 0.22 mf ±10%, 200 vdc	CGM-22-002
C6	Cap., elect., 1,600 mf -10 +100%, 60 vdc	CBS-16-074
C7	Cap., elect., 175 mf -10 +100%, 50 vdc	CBR-17-073
C8, C14	Not assigned	
CR2 thru CR5	Rectifier	FBL-00-054
CR8	Rectifier	FBL-00-030
CR14, CR15	Not assigned	
F1	Fuse, 5 amp, 8 AG, NORM-BLO	FFR-05-000
Q1, Q2	Transistor, NPN	FBN-L109
Q3, Q4	Transistor, NPN	FBN-36487
R2	Res., comp., 220 ohms ±10%, ¼ w	DCB-2211
R3	Res., comp., 10,000 ohms ±10%, 1 w	DGB-1031
R4	Res., comp., 18,000 ohms ±10%, ½ w	DEB-1831
R5	Res., comp., 1,200 ohms ±10%, ¼ w	DCB-1221
R7	Res., ww, 0.5 ohm ±5%, 5 w	DFM-50-015
R8	Res., var., ww or cermet, 23,000 ohms ±10%, ¾ w	DNT-23-072
R11	Same as R7	
R14	Not assigned	
R20	Res., film, 24,000 ohms ±5%, ½ w	DCT-24-031
R21	Res., film, 120,000 ohms ±1%, ½ w	DCV-12-019
T1	Transformer	ABA-CS4-36

MODEL LCS-4-48

C4	Not assigned	
C5	Cap., mylar, 0.22 mf ±10%, 200 vdc	CGM-22-002
C6	Cap., elect., 730 mf -10 +100%, 85 vdc	CBR-73-029
C7	Cap., elect., 60 mf -10 +100%, 100 vdc	CBP-60-051
C8, C14	Not assigned	
CR2 thru CR5	Rectifier	FBL-00-054
CR8	Rectifier	FBL-00-033
CR14, CR15	Not assigned	
F1	Fuse, 5 amp, 8 AG, NORM-BLO	FFR-05-000
Q1, Q2	Transistor, NPN	FBN-L108
Q3, Q4	Transistor, NPN	FBN-35902
R2	Res., comp., 220 ohms ±10%, ¼ w	DCB-2211

UNIQUE PARTS (Cont.)

MODEL LCS-4-48 (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
R3	Res., comp., 27,000 ohms ±10%, 1 w	DGB-2731
R4	Res., comp., 18,000 ohms ±10%, ½ w	DEB-1831
R5	Res., comp., 1,200 ohms ±10%, ¼ w	DCB-1221
R7	Res., ww, 0.68 ohm ±5%, 5 w	DFM-68-048
R8	Res., var., ww or cermet, 23,000 ohms ±10%, ¾ w	DNT-23-072
R11	Same as R7	
R14	Not assigned	
R20	Res., film, 39,000 ohms ±5%, ½ w	DCT-39-015
R21	Res., film, 200,000 ohms ±1%, ¼ w	DCV-20-028
T1	Transformer	ABA-CS4-48

COMMON PARTS

MODELS LCS-4-100—LCS-4-150

C1	Cap., elect., 40 mf -10 +75%, 25 vdc	CBP-40-036
C2	Cap., mylar, 0.047 mf ±10%, 200 vdc	CGL-47-018
C3, C4	Not assigned	
C5	Cap., mylar, 0.033 mf ±10%, 400 vdc	CGL-33-009
C7	Cap., elect., 39 mf -10 +100%, 200 vdc	CBP-39-050
C8	Not assigned	
C9	Cap., mylar, 1 mf ±10%, 200 vdc	CGN-10-005
C10	Same as C5	
C11	Cap., mylar, 0.0022 mf ±10%, 200 vdc	CGK-22-008
C12 thru C15	Not assigned	
C16	Cap., mylar, 0.1 mf ±10%, 200 vdc	CAM-10-012
CR1	Rectifier	FBL-00-030
CR2 thru CR5	Rectifier	FBL-00-033
CR6, CR7	Not assigned	
CR8	Same as CR2	
CR9	Not assigned	
CR10, CR11	Same as CR1	
CR12	Not assigned	
CR13	Same as CR1	
CR14 thru CR21	Not assigned	
CR22†	Rectifier, zener diode	FBM-Z139
F1	Fuse, 1½ amp, 8 AG, NORM-BLO	FFR-01-500
IC1*	Integrated circuit	FBT-00-030
Q1	Not assigned	
Q2	Transistor, NPN	FBN-L115
Q3, Q4	Transistor, NPN	FBN-38982

COMMON PARTS (Cont.)
MODELS LCS-4-100 — LCS-4-150 (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
R1	Res., film, 8,660 ohms ±1% ¼ w	DCS-87-071
R2	Res., comp., 100 ohms ±10%, ¼ w	DCB-1011
R3	Res., comp., 100,000 ohms ±10%, 1 w	DGB-1041
R4	Res., comp., 47,000 ohms ±10%, ½ w	DEB-4731
R5	Not assigned	
R6	Res., comp., 47 ohms ±10%, ¼ w	DCB-4701
R7	Res., ww, 3 ohms ±5%, 5 w	DFN-30-021
R8	Res., var., cermet, 75,000 ohms ±10%, 0.75 w	DRT-75-010
R9	Res., film, 10,000 ohms ±1%, ¼ w	DCT-10-047
R10*	Res., comp., 36 megohms ±5%, ¼ w	DCB-3665
R11	Same as R7	
R12	Res., comp., 68,000 ohms ±10%, ¼ w	DCB-6831
R13	Res., var., ww, 5,000 ohms ±10%, 1½ w	DNS-50-086
R14, R15	Not assigned	
R16	Res., comp., 470 ohms ±10%, ¼ w	DCB-4711
R17 thru R19	Not assigned	
R21	Res., film, 432,000 ohms ±1%, ½ w	DCV-43-021
R22	Not assigned	
R23	Res., comp., 4,700 ohms ±10%, ¼ w	DCB-4721
S1	Thermostat	FKA-124-013
XF1	Fuseholder	HRM-00-016

* On units with serial no. prefixes A & B, IC1 is FBT-00-002 and R10 is 68 megohms ±10%, DCB-6861.

† CR22 not used on units with serial no. prefixes A-D.

UNIQUE PARTS
MODEL LCS-4-100

C6	Cap., elect., 240 mf -10 + 100%, 200 vdc	CBR-24-033
R20	Res., film, 91,000 ohms ±5%, ½ w	DCT-91-055
T1	Transformer	ABA-CS4-100

MODEL LCS-4-120

C6	Cap., elect., 240 mf -10 +100%, 200 vdc	CBR-24-033
R20	Res., film, 91,000 ohms ±5%, ½ w	DCT-91-055
T1	Transformer	ABA-CS4-120

MODEL LCS-4-150

C6	Cap., elect., 200 mf -10 +100%, 250 vdc	CBR-20-045
R20	Res., film, 120,000 ohms ±1%, ½ w	DCV-12-019
T1	Transformer	ABA-CS4-150

COMMON PARTS
MODELS LCS-4-01 — LCS-4-05

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
C1	Cap., elect., 40 mf -10 + 75%, 25 vdc	CBP-40-036
C2	Cap., mylar, 0.047 mf ±10%, 200 vdc	CGL-47-018
C5	Not assigned	
C9	Cap., mylar, 1 mf ±10%, 200 vdc	CGN-10-005
C10	Cap., mylar 0.033 mf ±10%, 400 vdc	CGL-33-009
C13, C15	Not assigned	
C16	Cap., mylar, 0.1 mf ±10%, 200 vdc	CAM-10-012
CR1	Rectifier	FBL-00-030
CR2, CR5	Not assigned	
CR9 thru CR11	Same asCR1	
CR12	Not assigned	
CR13	Same as CR1	
CR21	Not assigned	
CR22**	Rectifier, zener diode	FBM-Z139
IC1*	Integrated circuit	FBT-00-031
R1*	Res., film, 8,660 ohms ±1%, ¼ w	DCS-87-071
R6	Res., film, 249 ohms ±1%, ¼ w	DCR-24-031
R9	Res., film, 10,000 ohms ±1%, ¼ w	DCT-10-047
R10†	Res., comp., 36 megohms ±5%, ¼ w	DCB-3665
R12	Not assigned	
R13	Res., var., ww, 100 ohms ±20%, 2 w	DNR-10-016
R15	Not assigned	
R16	Res., comp., 470 ohms ±10%, ¼ w	DCB-4711
R20 thru R22	Not assigned	
R23	Res., comp., 100,000 ohms ±10%, ¼ w	DCB-1041
XF1	Fuseholder	HRM-00-016

* On units with serial no. prefix A, IC1 is FBT-00-002 and R1 is 9,100 ohms ±2%, DCS-91-050. On units with serial no. prefix B, IC1 is FBT-00-010.

† On units with serial no. prefixes A & B, R10 is 68 megohms ±10%, DCB-6861.

** CR22 not used on units with serial no. prefixes A-D.

UNIQUE PARTS
MODEL LCS-4-01

C3	Not assigned	
C4	Cap., mylar, 0.22 mf ±10%, 200 vdc	CGM-22-002
C6	Cap., elect., 4,800 mf -10 +100%, 20 vdc	CBS-18-076
C7	Cap., elect, 450 mf -10 +100%, 25 vdc	CBR-15-075
C8	Not assigned	
C11	Cap., mylar, 0.0022 mf ±10%, 200 vdc	CGK-22-008

UNIQUE PARTS (Cont.)

MODEL LCS-4-01 (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
C12	Cap., elect., 2.2 mf ±20%, 20 vdc	CBN-22-029
C14	Same as C4	
CR3, CR4, CR6	Not assigned	
CR7	Rectifier	FBL-00-054
CR8	Rectifier	FBL-00-030
CR14 thru CR16	Same as CR7	
CR17 thru CR20	Not assigned	
F1	Fuse, 10 amp, 8 AG, NORM-BLO	FFR-10-000
Q1, Q2	Transistor, NPN	FBN-L113
Q3, Q4	Transistor, NPN	FBN-36485
R2	Res., comp., 150 ohms ±10%, ¼ w	DCB-1511
R3	Res., comp., 1,000 ohms ±10%, 1 w	DGB-1021
R4	Res., ww, 220 ohms ±3%, 5 w	DFR-22-079
R5	Res., comp., 1,200 ohms ±10%, ¼ w	DCB-1221
R7	Res., ww, 0.25 ohm ±5%, 5 w	DFM-25-016
R8	Res., var., ww or cermet, 10,000 ohms ±10%, ¾ w	DNT-10-045
R11	Same as R7	
R14	Not assigned	
R17 thru R19	Not assigned	
S1	Thermostat	FKA-142-015
T1	Transformer	ABA-CS4-01

MODEL LCS-4-02

C3	Cap., mylar, 0.0047 mf ±10%, 200 vdc	CGK-47-002
C4	Cap., mylar, 0.22 mf ±10%, 80 vdc	CGM-22-004
C6	Cap., elect., 2,100 mf -10 +100%, 35 vdc	CBS-21-043
C7	Cap., elect., 280 mf -10 +100%, 40 vdc	CBR-28-074
C8	Not assigned	
C11	Same as C3	
C12	Not assigned	
C14	Same as C4	
C17	Cap., mylar, 0.01 mf ±10%, 200 vdc	CGL-10-002
CR3, CR4, CR6	Not assigned	
CR7	Rectifier	FBL-00-047
CR8	Rectifier	FBL-00-030
CR14 thru CR17	Same as CR7	
CR18 thru CR20	Not assigned	

UNIQUE PARTS (Cont.)

MODEL LCS-4-02 (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
F1	Fuse, 5 amp, 8 AG, NORM-BLO	FFR-05-000
Q1, Q2	Transistor, NPN	FBN-L109
Q3, Q4	Transistor, NPN	BN-36220
R2	Res., comp., 220 ohms ±10%, ¼ w	DCB-2211
R3	Res., comp., 3,300 ohms ±5%, 1 w	DGB-3325
R4	Res., ww, 480 ohms ±3%, 5 w	DFR-48-080
R5	Res., comp., 1,200 ohms ±10%, ¼ w	DCB-1221
R7	Res., ww, 0.5 ohm ±5%, 5 w	DFM-50-015
R8	Res., var., ww or cermet, 23,000 ohms ±10%, ¾ w	DNT-23-072
R11	Same as R7	
R14	Not assigned	
R17 thru R19	Not assigned	
S1	Thermostat	FKA-142-015
T1	Transformer	ABA-CS4-02

MODEL LCS-4-03

C3	Not assigned	
C4	Cap., mylar, 0.22 mf ±10%, 80 vdc	CGM-22-004
C6	Cap., elect., 1,100 mf -10 +100%, 60 vdc	CBS-11-042
C7	Cap., elect., 175 mf -10 +100%, 50 vdc	CBR-17-073
C8	Not assigned	
C11	Cap., mylar, 0.001 mf ±10%, 200 vdc	CGK-10-004
C12	Not assigned	
C14	Same as C4	
CR3, CR4, CR6	Not assigned	
CR7	Rectifier	FBL-00-047
CR8	Rectifier	FBL-00-030
CR14, CR15	Rectifier	FBL-00-065
CR16	Same as CR7	
CR17	Not assigned	
CR18, CR19	Same as CR8	
CR20	Not assigned	
F1	Fuse, 3 amp, 8 AG, NORM-BLO	FFR-03-000
Q1, Q2	Transistor, NPN	FBN-L109
Q3, Q4	Transistor, NPN	FBN-36220
Q5	Same as Q1	
R2	Res., comp., 220 ohms ±10%, ¼ w	DCB-2211
R3	Res., comp, 10,000 ohms ±10%, 1 w	DGB-1031
R4	Not assigned	
R5	Res., comp., 1,200 ohms ±10%, ¼ w	DCB-1221
R7	Res., ww, 1.0 ohm ±3%, 5 w	DFN-10-014

UNIQUE PARTS (Cont.)
MODEL LCS-4-03 (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
R8	Res., var., cermet, 40,000 ohms ±10%, 0.75 w	DRT-40-009
R11	Same as R7	
R14	Not assigned	
R17	Same as R3	
R18	Res., comp., 820 ohms ±10%, ¼ w	DCB-8211
R19	Res., comp., 330 ohms ±10%, ¼ w	DCB-3311
S1	Thermostat	FKA-142-015
T1	Transformer	ABA-CS4-03

MODEL LCS-4-04

C3	Not assigned	
C4	Cap., mylar, 0.1 mf ±10%, 200 vdc	CAM-10-012
C6	Cap., elect., 520 mf -10 +100%, 100 vdc	CBR-52-025
C7	Cap., elect., 60 mf -10 +100%, 100 vdc	CBP-60-051
C8	Not assigned	
C11	Cap., mica, 680 pf ±10%, 300 vdc	CCJ-68-006
C12	Not assigned	
C14	Same as C4	
CR3, CR4	Rectifier	FBL-00-033
CR6	Rectifier	FBL-00-036
CR7	Not assigned	
CR8	Same as CR6	
CR14 thru CR17	Not assigned	
CR18, CR19	Rectifier	FBL-00-030
CR20	Same as CR6	
F1	Fuse, 1½ amp, 8 AG, NORM-BLO	FFR-01-500
Q1, Q2	Transistor, NPN	FBN-L108
Q3, Q4	Transistor, NPN	FBN-35902
Q5	Same as Q1	
R2	Res., comp., 180 ohms ±10% , ¼ w	DCB-1811
R3	Res., comp., 27,000 ohms ±10%, 1 w	DGB-2731
R4	Not assigned	
R5	Res., comp., 1,200 ohms ±10%, ¼ w	DCB-1221
R7	Res., ww, 1.82 ohms ±2%, 3 w	DFM-18-067
R8	Res., var., cermet, 75,000 ohms ±10%, 0.75 w	DRT-75-010
R11	Same as R7	
R14	Not assigned	
R17	Same as R3	
R18	Res., comp., 820 ohms ±10%, ¼ w	DCB-8211
R19	Res., comp., 330 ohms ±10%, ¼ w	DCB-3311
S1	Thermostat	FKA-142-015
T1	Transformer	ABA-CS4-04

UNIQUE PARTS (Cont.)
MODEL LCS-4-05

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
C3	Not assigned	
C4	Cap., mylar, 0.033 mf ±10%, 400 vdc	CGL-33-009
C6	Cap., elect., 240 mf -10 +100%, 200 vdc	CBR-24-033
C7	Cap., elect., 39 mf -10 +100%, 200 vdc	CBP-39-050
C8	Not assigned	
C11	Cap., mylar 0.0022 mf ±10%, 200 vdc	CGK-22-008
C12	Not assigned	
C14	Same as C4	
CR3, CR4	Rectifier	FBL-00-050
CR6	Rectifier	FBL-00-033
CR7	Not assigned	
CR8	Same as CR6	
CR14 thru CR17	Not assigned	
CR18, CR19	Rectifier	FBL-00-030
CR20	Same as CR6	
F1	Fuse, 1½ amp, 8 AG, NORM-BLO	FFR-01-500
Q1	Not assigned	
Q2	Transistor, NPN	FBN-L115
Q3, Q4	Transistor, NPN	FBN-38982
Q5	Same as Q2	
R2	Res., comp., 100 ohms ±10%, ¼ w	DCB-1011
R3	Res., comp., 100,000 ohms ±10%, 1 w	DGB-1041
R4, R5	Not assigned	
R7	Res., ww, 4.0 ohms ±5%, 5 w	DFN-40-018
R8	Res., var., cermet, 150,000 ohms ±10%, 0.75 w	DRV-15-006
R11	Same as R7	
R14	Not assigned	
R17	Same as R3	
R18	Res., comp., 820 ohms ±10%, ¼ w	DCB-8211
R19	Res., comp., 330 ohms ±10%, ¼ w	DCB-3311
S1	Thermostat	FKA-137-014
T1	Transformer	ABA-CS4-05

PARTS FOR "V" OPTION

On all LCS-4 models with suffix "V", transformer T1 changes and capacitor C10 is removed. For transformer T1 used on these models, see standard LCS-4 model parts list for the standard transformer part no. and add suffix "G"* to the part no.

* suffix "V" for serial no. prefixes A-C.

PARTS FOR SYSTEMS
POWER CONTROL PANEL ACCESSORY
MODEL SP5
COMMON PARTS

QUANT.	DESCRIPTION	NO.	LAMBDA NO.
1	Cap., tant., 1.7 mf -15 +75%, 150 vdc		CBN-17-031
1	Pilot light, red neon		FCA-OO-013
1*	Res., comp., 47,000 ohms ±10%, ¼ w		DCB-4731
1	Power "ON-OFF" switch		FDA-11-040

* On units with "V" option, this component is 150,000 ohms, part no. DCB-1541.

UNIQUE PARTS

MODEL LCS-4-3

1	Res., var., cermet, 2,200 ohms ±10%, 2 w	DRS-22-007
1	Res., meter shunt, 5A, 50 mV	ESN-50-002
1	Res. meter multiplier, film, 4,990 ohms ±1% ¼ w	DCS-50-063

MODELS LCS-4-3P6 — LCS-4-4P5

1	Res., var., cermet, 4,500 ohms ±10%, 2 w	DRS-45-009
1	Res., meter shunt, 5A, 5 mV	ESN-50-002
1	Res., meter multiplier, film, 4,990 ohms ±1%, ¼ w	DCS-50-063

MODELS LCS-4-5 — LCS-4-8

1	Res., var., cermet, 4,500 ohms ±10%, 2 w	DRS-45-009
1	Res., meter shunt, 5A, 50 mV	ESN-50-002
1	Res., meter multiplier, film, 10,000 ohms ±1%, ¼ w	DCT-10-047

MODELS LCS-4-10 AND LCS-4-12

1	Res., var., cermet, 9,000 ohms ±10%, 2 w	DRS-90-004
1	Res., meter shunt, 5A, 50 mV	ESN-50-002
1	Res., meter multiplier, film, 20,000 ohms ±1%, ¼ w	DCT-20-053

MODELS LCS-4-15 AND LCS-4-18

1	Res., var., cermet, 23,000 ohms ±10%, 2 w	DRT-23-018
1	Res., meter shunt, 5A, 50 mV	ESN-50-002
1	Res., meter, multiplier, film, 20,000 ohms ±1%, ¼ w	DCT-20-053

MODELS LCS-4-20 AND LCS-4-24

1	Res., var., cermet, 23,000 ohms ±10%, 2 w	DRT-23-018
1	Res., meter shunt, 5A, 50 mV	ESN-50-002
1	Res., meter multiplier, film, 49,900 ohms ±1%, ¼ w	DCT-50-054

PARTS FOR SYSTEMS
POWER CONTROL PANEL ACCESSORY
MODEL SP5 (Cont.)
UNIQUE PARTS (Cont.)
MODELS LCS-4-28 — LCS-4-48

QUANT.	DESCRIPTION	LAMBDA NO.
1	Res., var., cermet, 23,000 ohms ±10%, 2 w	DRT-23-018
1	Res., meter shunt, 2A, 50 mV	ESN-20-001
1	Res., meter multiplier, film, 49,900 ohms ±1%, ¼ w	DCT-50-054

MODELS LCS-4-100 — LCS-4-150

1	Res., var., cermet, 75,000 ohms ±10%, 2 w	DRT-75-020
1	Res., meter shunt, ww, 0.1 ohm ±1%, 0.33 w	DEM-10-001
1	Res., meter multiplier, film, 200,000 ohms ±1%, ¼ w	DCV-20-028

MODEL LCS-4-01

1	Res., var., cermet, 9,000 ohms ±10%, 2 w	DRS-90-004
1	Res., meter shunt, 5A, 50 mV	ESN-50-002
1	Res., meter multiplier, film, 10,000 ohms ±1%, ¼ w	DCT-10-047

MODEL LCS-4-02

1	Res., var., comp., 27,000 ohm ±10%, ½ w	DMT-27-007
1	Res., meter shunt, 2A, 50 mV	ESN-20-001
1	Res., meter multiplier, film, 20,000 ohms ±1%, ¼ w	DCT-20-053

MODEL LCS-4-03

1	Res., var., comp., 40,000 ohms ±10%, ½ w	DMT-40-008
1	Res., meter shunt, ww, 0.05 ohm ±1%, 0.33 w	DEL-50-001
1	Res., meter multiplier, film, 49,900 ohms ±1%, ¼ w	DCT-50-054

MODEL LCS-4-04

1	Res. var., comp., 75,000 ohms ±10%, ½ w	DMT-75-009
1	Res., meter shunt, ww, 0.05 ohm ±1%, 0.33 w	DEL-50-001
1	Res., meter multiplier, film, 100,000 ohms ±1%, ¼ w	DCV-10-027

MODEL LCS-4-05

1	Res., var., comp., 150,000 ±10%, ½ w	DMV-15-006
1	Res., meter shunt, ww, 0.1 ohm ±1%, 0.33 w	DEM-10-001
1	Res., meter multiplier, film, 200,000 ohms ±1%, ¼ w	DCV-20-028

PARTS FOR SYSTEM METERING PANEL ACCESSORY MODEL SMP-5

QUANT.	DESCRIPTION	LAMBDA NO.
1	Voltmeter	EBP-27-039
1	Ammeter	EDN-12-033
2	Pushbutton switch assembly	FDK-08-001
1	Selector switch, 3 pole, double throw	FDA-32-026

PARTS FOR OVERVOLTAGE PROTECTOR ACCESSORY MODELS LMOV-1, LMOV-2, LMOV-3, LHOV-4, LHOV-5, LHOV-6 COMMON PARTS

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
C1	Cap., mylar, 0.01 mf ±20%, 80 vdc	CGL-10-008
Q1	Transistor, NPN	FBN-L102
R3	Res., film, 200 ohms ±5%, ½ w	DCR-20-010
R4	Res., thermister, 425 ohms ±5%, 1¼ w	DKR-43-004
R5, R6	Res., comp., 1,200 ohms ±10%, ½ w	DEB-1221
R8	Res., comp., 15,000 ohms ±10%, ½ w	DEB-1531
R10	Same as R5	
SCR1	Rectifier, silicon controlled	FBP-00-009

UNIQUE PARTS MODEL LMOV-1

Q2	Transistor, PNP	FBN-L103
R1	Res., var., ww or cermet, 2,000 ohms ±10%, ¾ w	DNS-20-034
R2	Res., film, 560 ohms ±2%, ½ w	DCR-56-002
R7	Res., comp., 33 ohms ±5%, ¼ w	DCB-3305
R9	Not assigned	

MODEL LMOV-2

Q2	Transistor, PNP	FBN-L103
R1	Res., var., ww or cermet, 5,000 ohms ±10%, ¾ w	DNS-50-036
R2	Res., film, 1,470 ohms ±1%, ½ w	DCS-15-031
R7	Res., comp., 33 ohms ±5%, ¼ w	DCB-3305
R9	Not assigned	

MODEL LMOV-3

Q2	Transistor, PNP	FBN-L114
R1	Res., var., ww or cermet, 20,000 ohms ±10%, ¾ w	DNT-20-010
R2	Res., film, 4,700 ohms ±2%, ½ w	DCS-47-028
R7	Res., comp., 39 ohms ±5%, ¼ w	DCB-3905
R9	Res., comp., 22 ohms ±10%, ½ w	DEB-2201

PARTS FOR OVERVOLTAGE PROTECTOR ACCESSORY MODELS LMOV-1, LHOV-2, LMOV-3, LHOV-4, LHOV-5, LHOV-6 (Cont.) UNIQUE PARTS (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
	MODEL LHOV-4	
Q2	Transistor, PNP	FBN-L114
R1	Res., var., ww or cermet, 10,000 ohms ±10%, ¾ w	DNT-10-045
R2	Res., film, 560 ohms ±2%, ½ w	DCR-56-002
R7	Res., comp., 33 ohms ±5%, ¼ w	DCB-3305
R9	Res., comp., 22 ohms ±10%, ½ w	DEB-2201
	MODEL LHOV-5	
Q2	Transistor, PNP	FBN-L114
R1	Res., var., ww or cermet, 20,000 ohms ±10%, ¾ w	DNT-20-010
R2	Res., film, 560 ohms, ±2%, ½ w	DCR-56-002
R7	Res., comp., 33 ohms, ±5%, ¼ w	DCB-3305
R9	Res., comp., 22 ohms ±10%, ½ w	DEB-2201
	MODEL LHOV-6	
Q2	Transistor, PNP	FBN-L114
R1	Res., var., ww, 30,000 ohms ±10%, 0.6 w	DNT-30-027
R2	Res., film, 560 ohms ±2%, ½ w	DCR-56-002
R7	Res., comp., 33 ohms ±5%, ¼ w	DCB-3305
R9	Res., comp., 22 ohms ±10%, ½ w	DEB-2201

PARTS FOR METERED AND NON-METERED PANEL ACCESSORIES MODELS MP-5, P-5

C1, C2	Cap., tant., 2.5 mf -15 +75%, 100 vdc (All)	CBN-25-010
DS1	Pilot light assembly (All)	HRD-00-007
F1	Fuse, 3A, 3AG, SLO-BLO (All)	FFC-03-000
M1*	Voltmeter, 0-8 vdc (LCS-4-5, LCS-4-6, LCS-4-01)	EBN-80-005
M1*	Voltmeter, 0-15 vdc (LCS-4-12)	EBP-15-017
M1*	Voltmeter, 0-20 vdc (LCS-4-15, LCS-4-02)	EBP-20-014
M1*	Voltmeter, 0-25 vdc (LCS-4-20)	EBP-25-018
M1*	Voltmeter, 0-40 vdc (LCS-4-24, LCS-4-28, LCS-4-03)	EBP-40-013
M1*	Voltmeter, 0-60 vdc (LCS-4-48)	EBP-60-015
M2*	Ammeter, 0-10 adc (LCS-4-5, LCS-4-6)	EDP-10-013
M2*	Ammeter, 0-5 adc (LCS-4-12—LCS-4-24, LCS-4-01)	EDN-50-021
M2*	Ammeter, 0-3 adc (LCS-4-28, LCS-4-02)	EDN-30-019

PARTS FOR METERED AND NON-METERED PANEL ACCESSORIES (Cont.)

MODELS MP-5, P-5 (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
M2*	Ammeter, 0-2 adc (LCS-4-48)	EDN-20-022
M2*	Ammeter, 0-1.5 adc (LCS-4-03)	EDN-15-020
R1	Res., var., ww, 4,500 ohms ±5%, 2w (LCS-4-5, LCS-4-6)	DNS-45-059
R1	Res., var., ww, 9,000 ohms ±5%, 2w (LCS-4-12, LCS-4-01)	DNS-90-051
R1	Res., var., ww, 13,000 ohms (LCS-4-15—LCS-4-28)	DNT-13-031
R1	Res., var., cermet, 27,000 ohms ±10%, 2w (LCS-4-48,LCS-4-02)	DRT-27-001
R1	Res., var., cermet, 40,000 ohms ±10%, 2w (LCS-4-03)	DRT-40-040
S1	Switch, SPST (All)	FDA-11-040
XF1	Fuseholder (All)	HRK-00-007

* This part only used on MP-5

PARTS FOR METERED AND NON-METERED PANEL ACCESSORIES WITH "V" OPTION

On all metered and non-metered panels with suffix "V", fuse F1 changes and a resistor is added in series with pilot light DS1. Part nos. for F1 and DS1-Res. are listed here.

F1	Fuse, 1.5A, 3AG, SLO-BLO	FFC-01-500
DS1-Res.	Res., comp., 120,000 ohms ±10%, ½w	DEB-1241

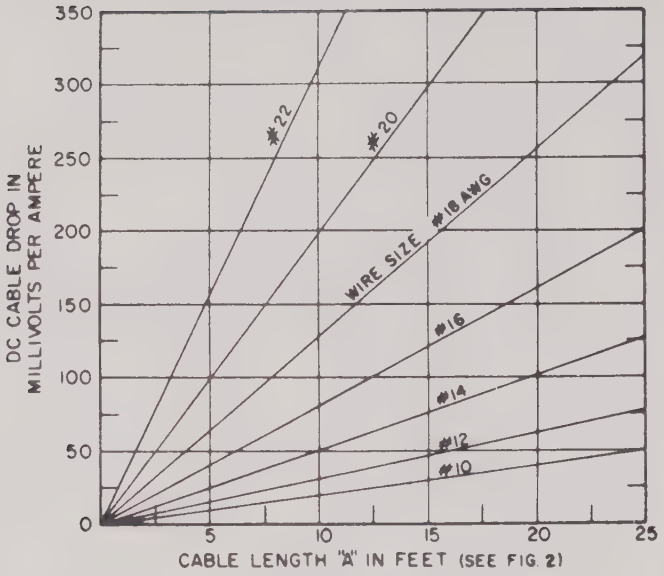


Figure 1. Cable Connection Chart

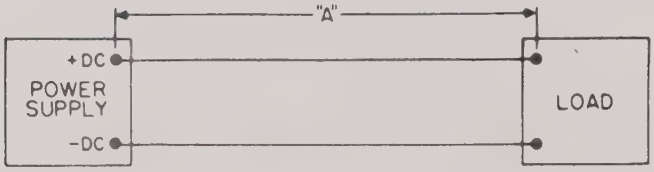
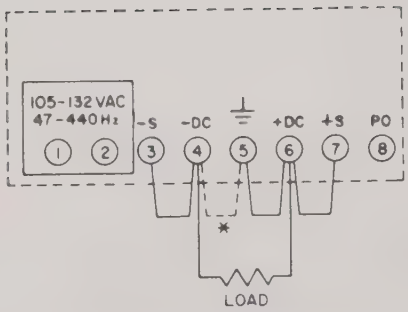
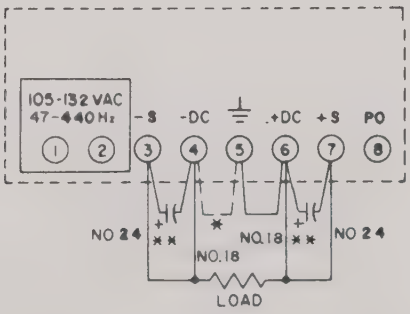


Figure 2. Cable Length "A" in Feet



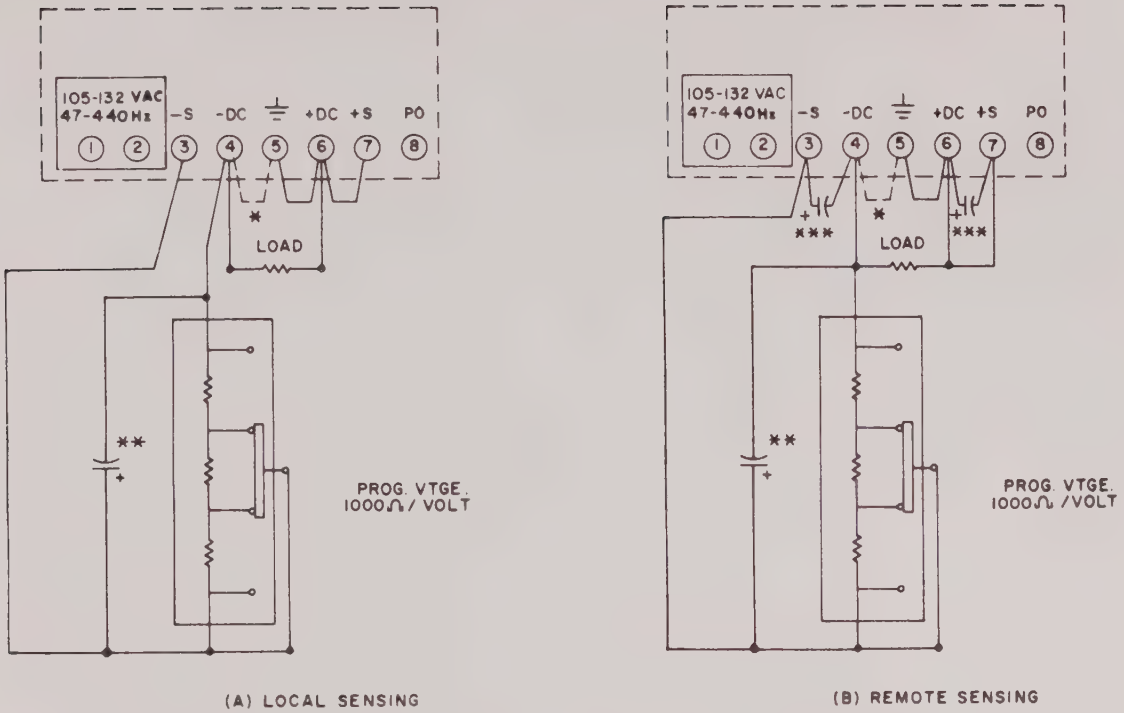
NOTE.
* FOR NEGATIVE GROUND, DISCONNECT JUMPER FROM TERMINALS 5 AND 6 AND RECONNECT TO TERMINALS 4 AND 5

Figure 3. Two-Wire Connection



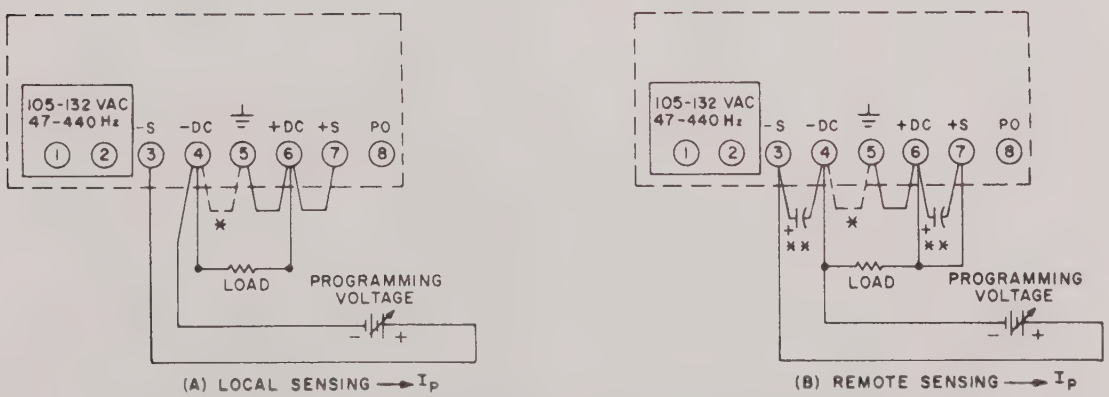
NOTE
* FOR NEGATIVE GROUND, DISCONNECT JUMPER FROM TERMINALS 5 AND 6 AND RECONNECT TO TERMINALS 4 AND 5
** 2.5 MF, ELECT. CAP. MAY BE REQUIRED.

Figure 4. Four-Wire Connection



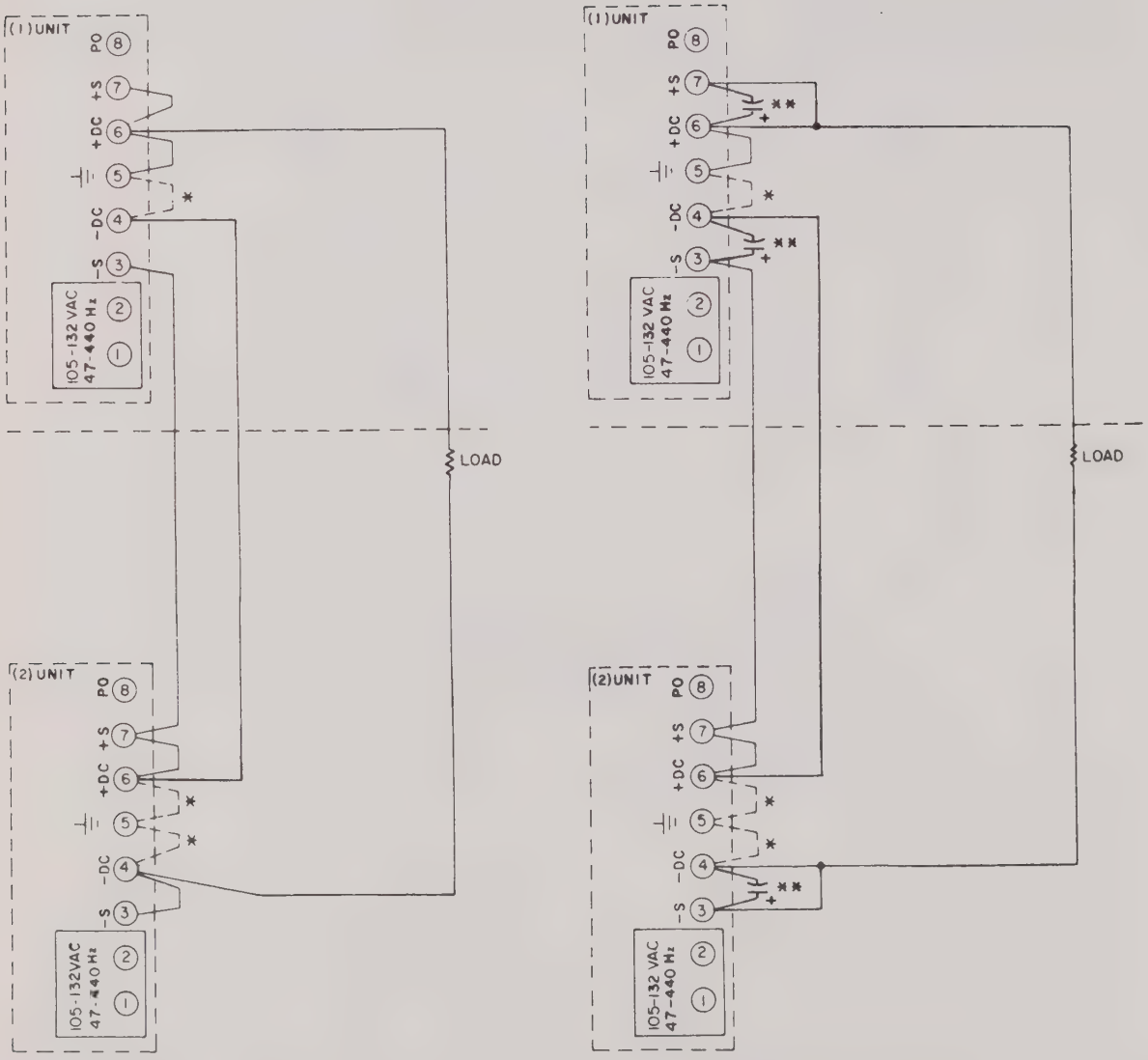
NOTE
* FOR NEGATIVE GROUND, DISCONNECT JUMPER FROM TERMINALS 5 AND 6 AND RECONNECT TO TERMINALS 4 AND 5.
** 2.5MF, 200V USED IN LCS-4-01 — LCS-4-04, LCS-4-3 — LCS-4-48
1.4MF, 400V USED ON LCS-4-05, LCS-4-100 — LCS-4-150
*** 2.5 MF, ELECT. CAP. MAY BE REQUIRED

Figure 5. Programmed Voltage, With External Resistor



NOTE
* FOR NEGATIVE GROUND, DISCONNECT JUMPER FROM TERMINALS 5 AND 6 AND RECONNECT TO TERMINALS 4 AND 5
** 2.5MF, ELECT. CAP. MAY BE REQUIRED.

Figure 6. Programmed Voltage, With External Programming Voltage Source

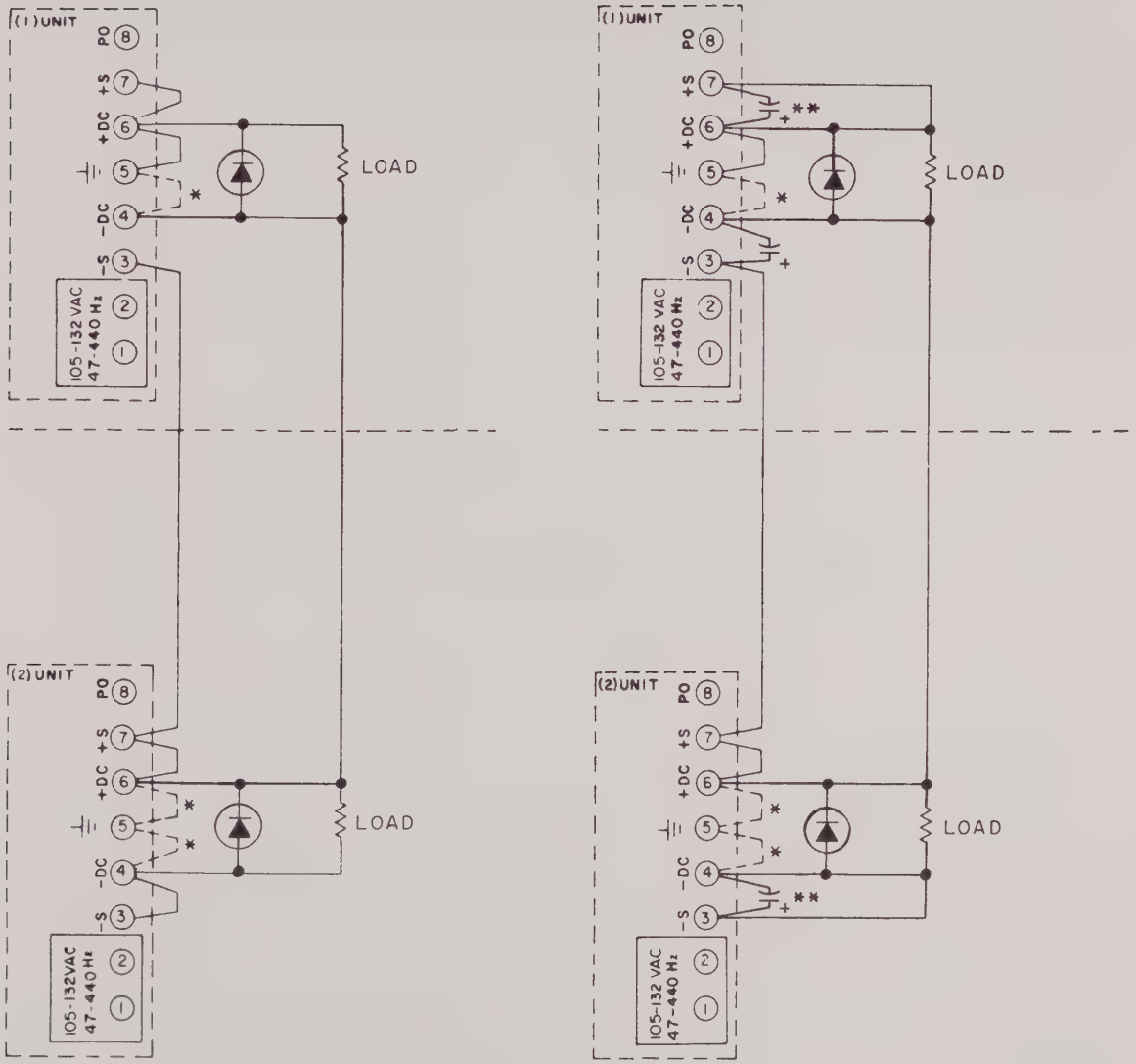


NOTE

* MAKE ONLY ONE GROUND CONNECTION FOR THE SERIES COMBINATION; TO CHANGE GROUND AS SHOWN, REMOVE JUMPER FROM TERMINALS 5 AND 6 ON (M) UNIT AND CONNECT ANY ONE OF THE OTHER JUMPERS AS SHOWN IN DOTTED LINE

** 2.5 MF, ELECT. CAP. MAY BE REQUIRED.

Figure 7. Series Connection, LCS-4-01 thru LCS-4-05 Only, Common Load



(A) LOCAL SENSING

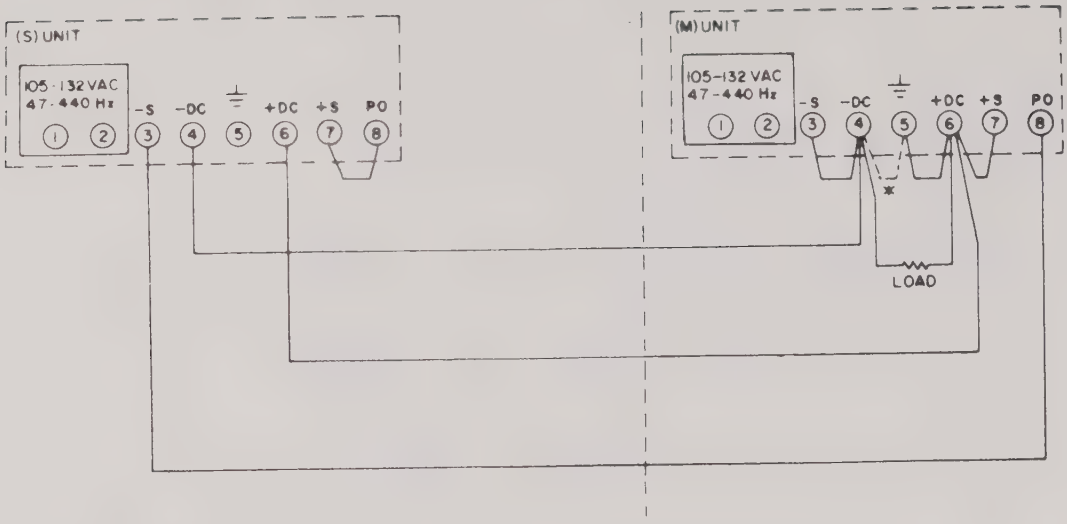
(B) REMOTE SENSING

NOTE

* MAKE ONLY ONE GROUND CONNECTION FOR THE SERIES COMBINATION; TO CHANGE GROUND AS SHOWN, REMOVE JUMPER FROM TERMINALS 5 AND 6 ON (M) UNIT AND CONNECT ANY ONE OF THE OTHER JUMPERS AS SHOWN IN DOTTED LINE

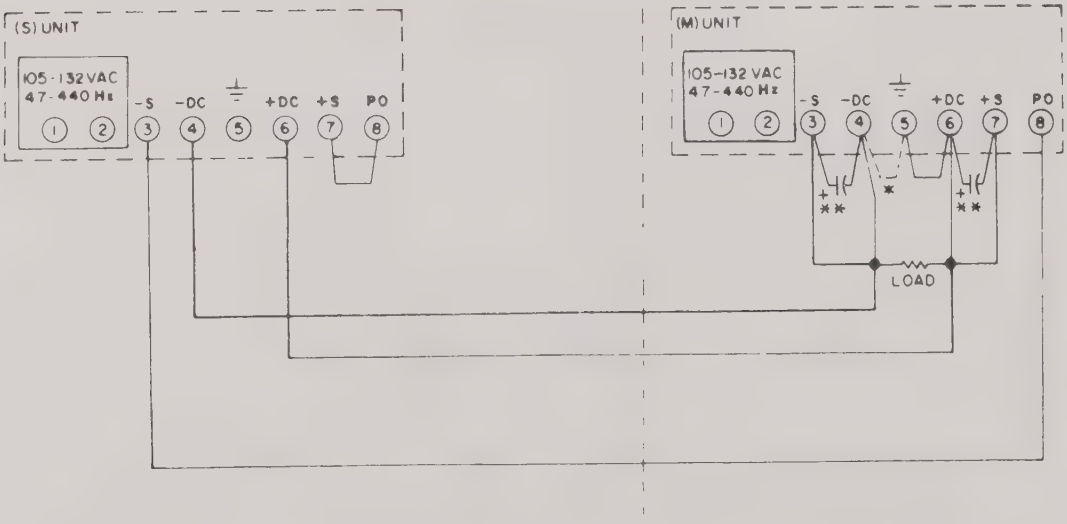
** 2.5 MF, ELECT. CAP. MAY BE REQUIRED.

Figure 7A. Series Connection (Diodes Not Required For LCS-4-01 thru LCS-4-05), Dual Load



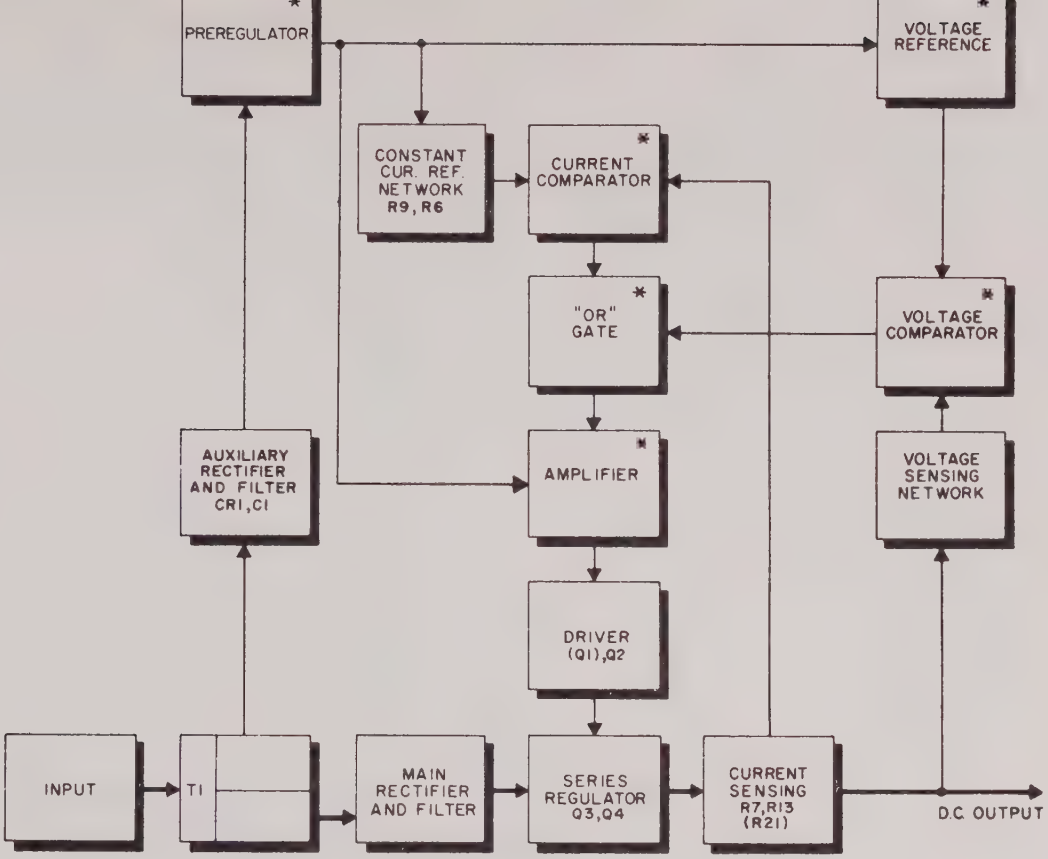
NOTE
* FOR NEGATIVE GROUND, DISCONNECT JUMPER FROM TERMINALS 5 AND 6 AND RECONNECT TO TERMINALS 4 AND 5

Figure 8. Parallel Connection, Local Sensing, LCS-4-01 — LCS-4-05 Only



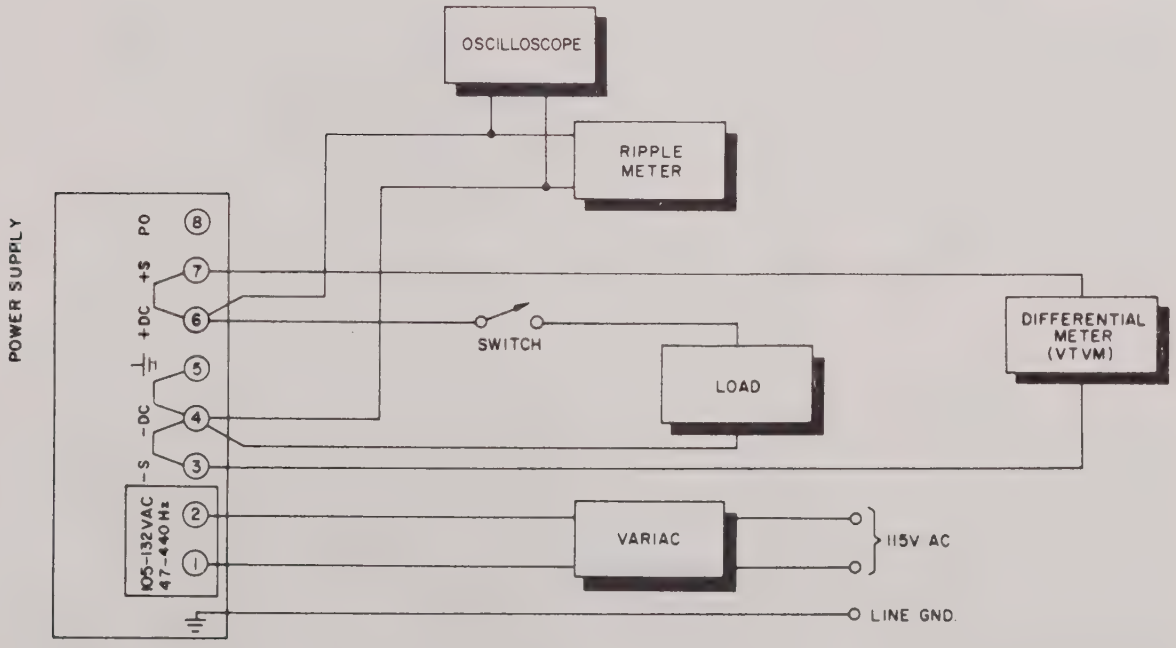
NOTE
* FOR NEGATIVE GROUND, DISCONNECT JUMPER FROM TERMINALS 5 AND 6 AND RECONNECT TO TERMINALS 4 AND 5
** 2.5 MF, ELECT. CAP. MAY BE REQUIRED.

Figure 9. Parallel Connection, Remote Sensing. LCS-4-01 — LCS-4-05 Only



* THIS CIRCUIT ELEMENT IS LOCATED IN IC1.

Figure 10. Typical Block Diagram



NOTES

1. REGULATION AND RIPPLE CHECK METERS MUST NOT BE GROUNDED THROUGH THREE-WIRE LINE CORD TO GROUND
2. PERFORM CHECKS WITH LOCAL SENSING CONNECTIONS ONLY

Figure 11. Test Connections For Constant Voltage Performance Checks

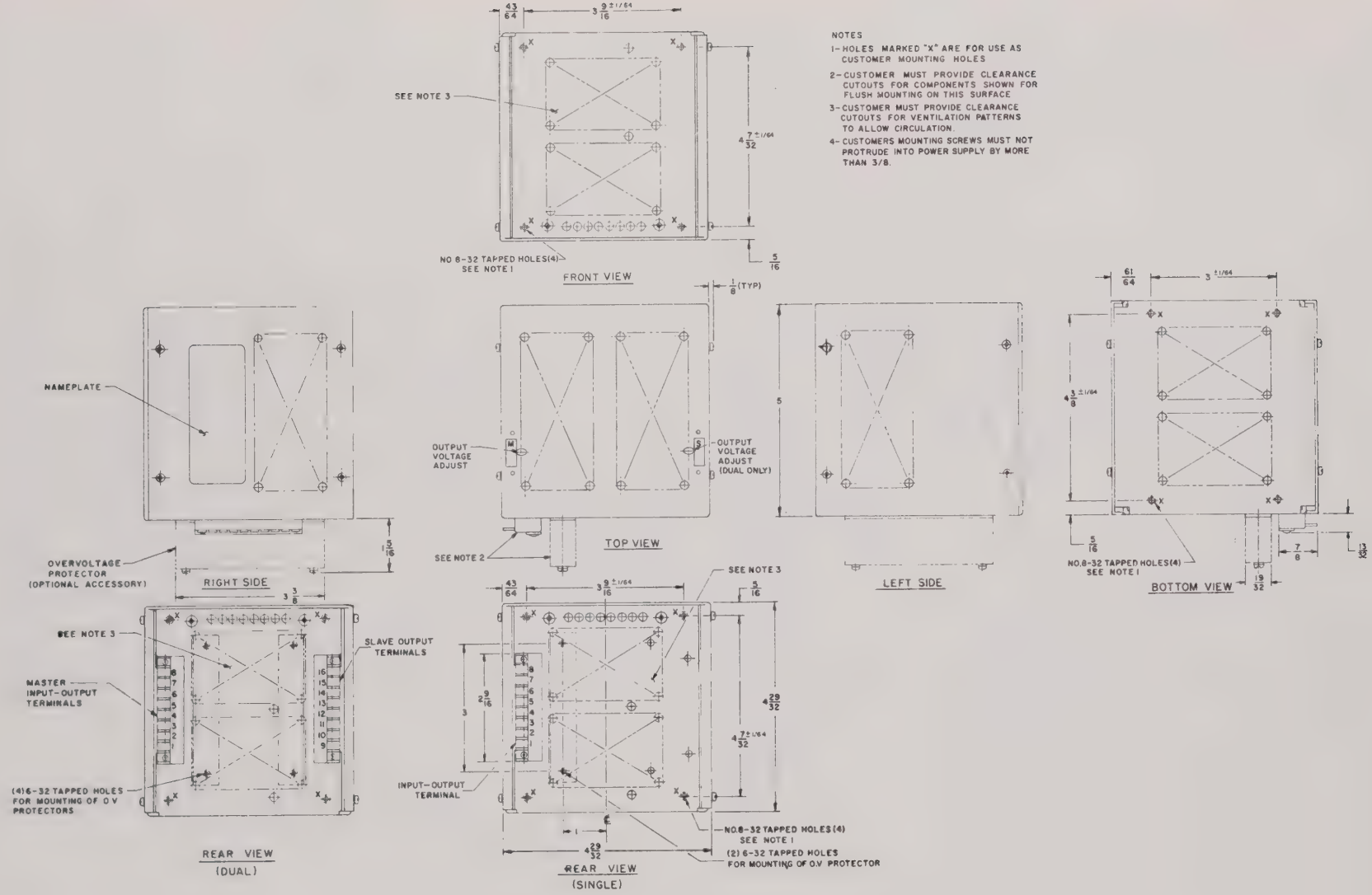
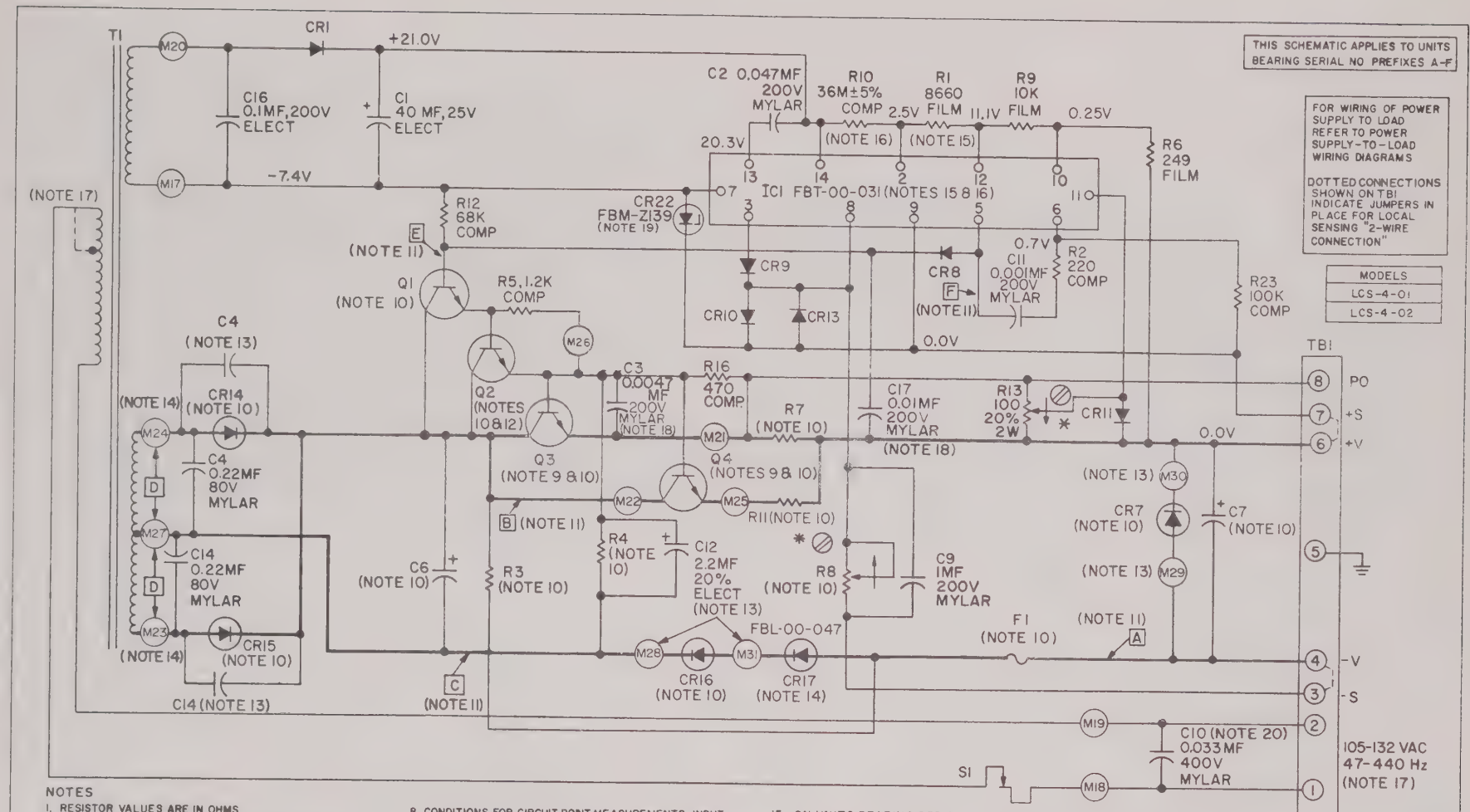
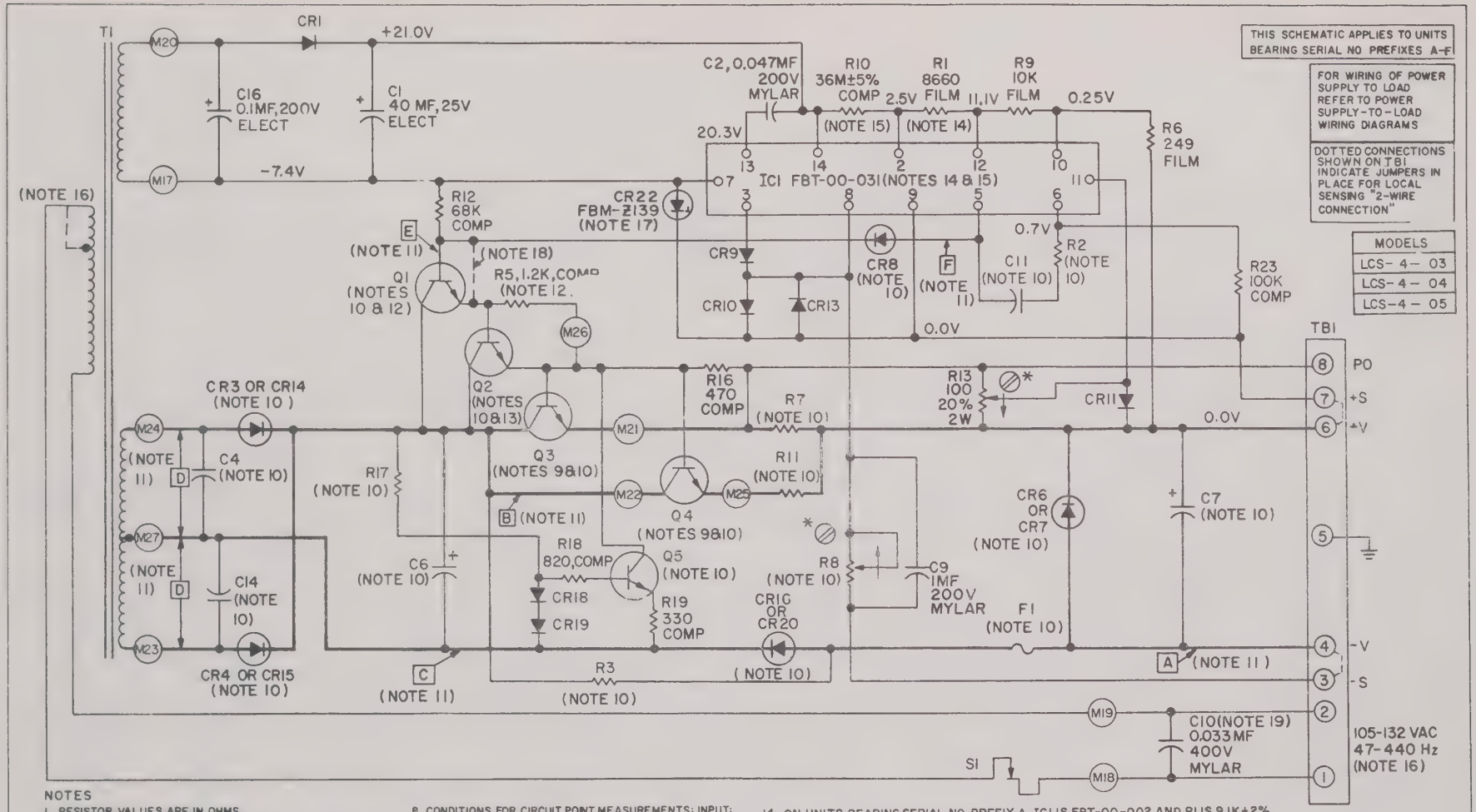

NOTES
1- HOLES MARKED "X" ARE FOR USE AS CUSTOMER MOUNTING HOLES
2- CUSTOMER MUST PROVIDE CLEARANCE CUTOUTS FOR COMPONENTS SHOWN FOR FLUSH MOUNTING ON THIS SURFACE
3- CUSTOMER MUST PROVIDE CLEARANCE CUTOUTS FOR VENTILATION PATTERNS TO ALLOW CIRCULATION.
4- CUSTOMERS MOUNTING SCREWS MUST NOT PROTRUDE INTO POWER SUPPLY BY MORE THAN 3/8.
SEE NOTE 3
NO 8-32 TAPPED HOLES(4) SEE NOTE 1
FRONT VIEW
NAMEPLATE
OVERVOLTAGE PROTECTOR (OPTIONAL ACCESSORY)
RIGHT SIDE
OUTPUT VOLTAGE ADJUST
OUTPUT VOLTAGE ADJUST (DUAL ONLY)
SEE NOTE 2
TOP VIEW
LEFT SIDE
NO.8-32 TAPPED HOLES(4) SEE NOTE 1
BOTTOM VIEW
SEE NOTE 3
SLAVE OUTPUT TERMINALS
MASTER INPUT-OUTPUT TERMINALS
(4)6-32 TAPPED HOLES FOR MOUNTING OF O.V PROTECTORS
REAR VIEW (DUAL)
INPUT-OUTPUT TERMINAL
NO.8-32 TAPPED HOLES(4) SEE NOTE 1
(2) 6-32 TAPPED HOLES FOR MOUNTING OF O.V PROTECTOR
REAR VIEW (SINGLE)

Figure 12. Outline Drawing



NOTES

1. RESISTOR VALUES ARE IN OHMS
2. RESISTOR WATTAGE 1/4 WATT; RESISTORS ABOVE 2 WATTS ARE WIREWOUND UNLESS OTHERWISE NOTED
3. RESISTOR TOLERANCES COMP. ±10%; WIREWOUND ±2% FILM ±1%; UNLESS OTHERWISE NOTED
4. CAPACITOR TOLERANCES ELECTROLYTIC -10%, +100%, MYLAR ±10%; CERAMIC 10%, UNLESS OTHERWISE NOTED.
5. SYMBOLS
   - INDICATES CLOCKWISE ROTATION OF SHAFT.
   - INDICATES CONNECTION TO CHASSIS
   - INDICATES ADJUSTMENT OR CALIBRATION CONTROL.
   - SEE INSTRUCTION MANUAL.
   - LAMBDA PT #FBL-00-030, USE IN 4002 DIODE FOR REPLACEMENT UNLESS OTHERWISE NOTED.
   - INDICATES TERMINAL ON PRINTED WIRING BOARD.
6. DESIGNATION IS LAMBDA PART NUMBER
7. DERATE CURRENT 10% FOR 47-57Hz, FOR 63-440Hz CONSULT FACTORY.
8. CONDITIONS FOR CIRCUIT POINT MEASUREMENTS: INPUT: 115 VAC, 60Hz; MAX. RATED VOLTAGE NO LOAD. INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE DC UNLESS OTHERWISE NOTED. DC MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLTMETER BETWEEN +S (TERM 15) & INDICATED POINTS UNLESS NOTED; +S AND +V SHORTED, -S AND -V SHORTED
9. COAT BOTH SIDES OF INSULATING WAFER WITH DOW CORNING NO.340 SILICONE GREASE.
10. SEE TABLE I FOR COMPONENT VALUES
11. SEE TABLE I FOR VOLTAGE VALUES.
12. IF Q2 IS REPLACED RETAIN RADIATOR AND INSTALL WITH NEW TRANSISTOR.
13. C12 TERM'S M28, M29, M30, M31 ONLY USED ON MODEL LCS-4-01 AND C4, C14 LOCATED AS SHOWN
14. CR17 AND TERM'S M23, M24, M27 ONLY USED ON MODEL LCS-4-02
15. ON UNITS BEARING SERIAL NO. PREFIX A, IC1 IS FBT-00-002 AND R11 IS 9.1K ±2%.
16. ON UNITS BEARING SERIAL NO. PREFIX B, IC1 IS FBT-00-010, ON UNITS BEARING SERIAL NO. PREFIXES A & B, R10 IS 68M ±10%.
17. ON UNITS WITH "V" OPTION, T1 HAS TAPPED PRIMARY. "V" OPTION UNITS CAN BE WIRED FOR 187-242V INPUT (USING TAP), OR FOR 205-265V INPUT. (USING ENTIRE PRIMARY). ON SERIAL NO. PREFIXES A-C, "V" OPTION UNITS; T1 PRIMARY IS NOT TAPPED, AC INPUT IS 205-265V.
18. C3 AND C17 ONLY USED ON MODEL LCS-4-02 WITH SERIAL NO. PREFIXES A-E.
19. CR22 NOT USED ON UNITS WITH SERIAL NO. PREFIXES A-D.
20. C10 NOT USED ON UNITS WITH "V" OPTION.



NOTES

1. RESISTOR VALUES ARE IN OHMS
2. RESISTOR WATTAGE 1/4 WATT; RESISTORS ABOVE 2 WATTS ARE WIREWOUND UNLESS OTHERWISE NOTED
3. RESISTOR TOLERANCES: COMP. ±10%; WIREWOUND ±2% FILM ±1%; UNLESS OTHERWISE NOTED
4. CAPACITOR TOLERANCES: ELECTROLYTIC -10%, +100%; MYLAR ±10%, CERAMIC 10%, UNLESS OTHERWISE NOTED.
5. SYMBOLS
   - INDICATES CLOCKWISE ROTATION OF SHAFT.
   - INDICATES CONNECTION TO CHASSIS
   - INDICATES ADJUSTMENT OR CALIBRATION CONTROL.
   - SEE INSTRUCTION MANUAL.
   - LAMBDA PT. #FBL-00-030, USE IN 4002 DIODE FOR REPLACEMENT UNLESS OTHERWISE NOTED.
   - INDICATES TERMINAL ON PRINTED WIRING BOARD.
6. DESIGNATION IS LAMBDA PART NUMBER
7. DERATE CURRENT 10% FOR 47-57Hz, FOR 63-440Hz CONSULT FACTORY.
8. CONDITIONS FOR CIRCUIT POINT MEASUREMENTS: INPUT: 115 VAC, 60Hz; MAX. RATED VOLTAGE NO LOAD. INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE DC UNLESS OTHERWISE NOTED. DC MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLTMETER BETWEEN +S (TERM.15) & INDICATED POINTS UNLESS NOTED; +S AND +V SHORTED, -S AND -V SHORTED.
9. COAT BOTH SIDES OF INSULATING WAFER WITH DOW CORNING NO.340 SILICONE GREASE.
10. SEE TABLE I FOR COMPONENT VALUES
11. SEE TABLE I FOR VOLTAGE VALUES
12. THIS COMPONENT NOT USED ON MODEL LCS-4-05.
13. IF Q2 IS REPLACED RETAIN RADIATOR AND INSTALL WITH NEW TRANSISTOR.
14. ON UNITS BEARING SERIAL NO. PREFIX A, IC1 IS FBT-00-002 AND R1 IS 9.1K±2%.
15. ON UNITS BEARING SERIAL NO. PREFIX B, IC1 IS FBT-00-010. ON UNITS BEARING SERIAL NO. PREFIXES A & B, R10 IS 68M±10%.
16. ON UNITS WITH "V" OPTION, T1 HAS TAPPED PRIMARY. "V" OPTION UNITS CAN BE WIRED FOR 187-242V INPUT (USING TAP), OR FOR 205-265V INPUT (USING ENTIRE PRIMARY) ON SERIAL NO. PREFIXES A-C, "V" OPTION UNITS; T1 PRIMARY IS NOT TAPPED. AC INPUT IS 205-265V.
17. CR22 NOT USED ON UNITS WITH SERIAL NO. PREFIXES A-D.
18. MODEL LCS-4-05 ONLY.
19. C10 NOT USED ON UNITS WITH "V" OPTION.

LAMBDA
ELECTRONICS
MELVILLE, L.I., NEW YORK
DIVISION OF Vesco INSTRUMENT INC.

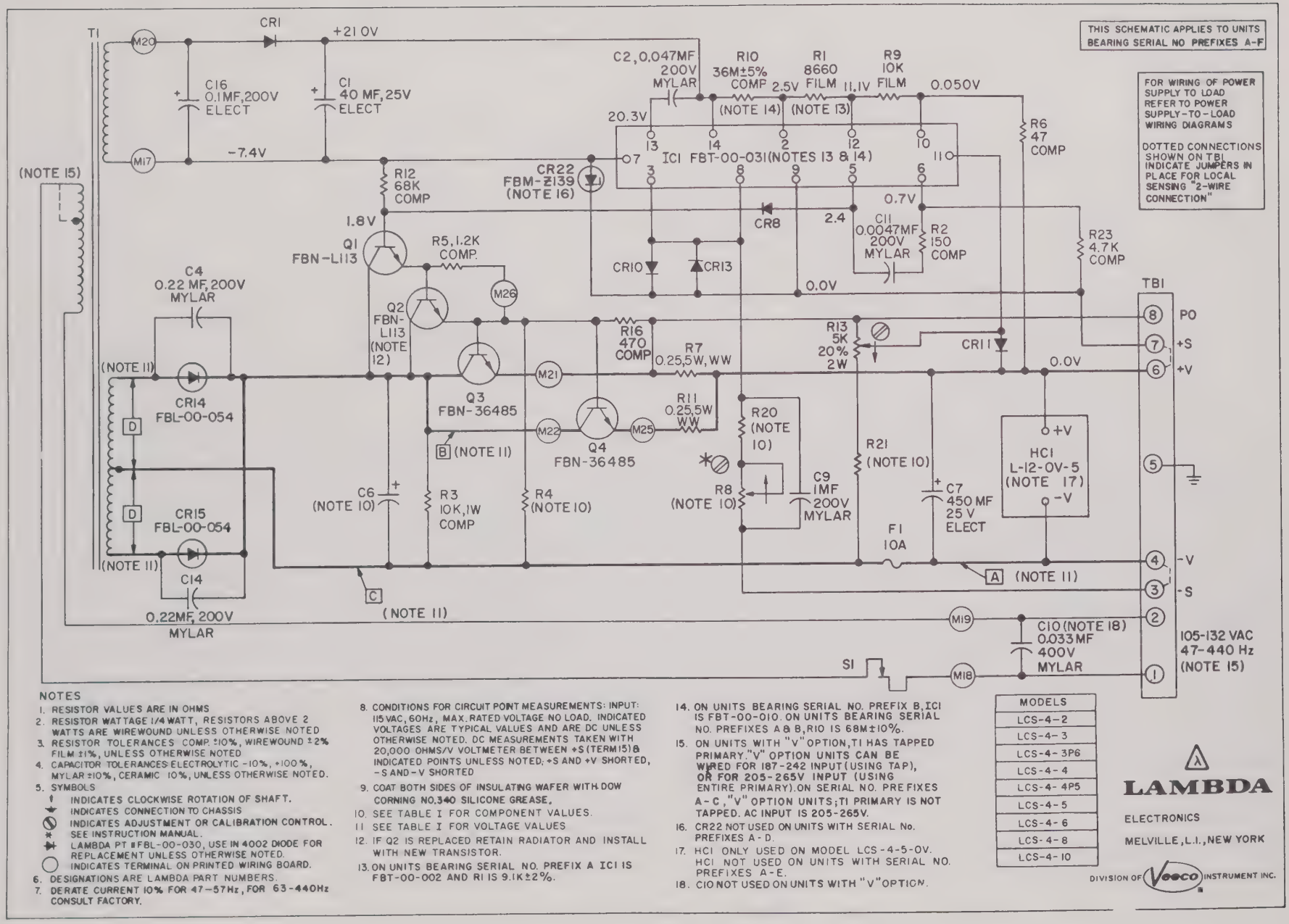
TABLE I

DATA REFERENCES FOR

MODELS LCS-4-01 — LCS-4-05

Model	Schematic Voltage Measurements						Schematic Components																		
							C4, C14	C6	C7	C11	CR3, CR4	CR6	CR7	CR8	CR14-CR15	CR16	CR20	F1	Q1, Q2	Q3, Q4	Q5	R2	R3	R4	R7	R8	R11	R17
	A (VDC)	B (VDC)	C (VDC)	D (VAC)	E (VDC)	F (VDC)	±10% MYLAR	-10+100% ELECT	-10+100% ELECT	±10%	*FBL-00-	*FBL-00-	*FBL-00-	*FBL-00-	*FBL-00-	*FBL-00-	*FBL-00-	(AMPS)	*FBN-	*FBN-	*FBN-	±10%, 1/4W COMP	1W COMP	±3%, 5W WW	WW	±10% 3/4W	WW	±10%, 1W COMP
LCS-4-01	-7.0	12.4	-7.6	14.2	1.8	2.4	0.22 mf 80V	4,800 mf 20V	450 mf 25V	0.0022 mf 200V MYLAR	Not used	Not used	054	030	054	054	Not used	10	L113	36485	Not used	150	1K ±10%	220	0.25 ±5% 5W	10K WW or CERMET	0.25 ±5% 5W	Not used
LCS-4-02	-18.0	18.0	-18.6	26.2	1.8	2.4	0.22 mf 80V	2,100 mf 35V	280 mf 40V	0.001 mf 200V MYLAR	Not used	Not used	047	030	047	047	Not used	5	L109	36220	Not used	220	3.3K ±5%	480	0.50 ±5% 5W	23K WW or CERMET	0.50 ±5% 5W	Not used
LCS-4-03	-32.0	23.0	-32.6	39.4	1.8	2.4	0.22 mf 80V	1,100 mf 60V	175 mf 50V	0.001 mf 200V MYLAR	Not used	Not used	047	030	047	047	Not used	3	L109	36220	L109	220	10K ±10%	Not used	1.0 ±3% 5W	40K CERMET	1.0 ±3% 5W	10K
LCS-4-04	-60.0	34.0	-60.6	67.0	1.8	2.4	0.1 mf 200V	520 mf 100V	60 mf 100V	680 pf 300V MICA	033	036	Not used	036	Not used	Not used	036	1-1/2	L108	35902	L108	180	27K ±10%	Not used	1.82 ±2% 3W	75K CERMET	1.82 ±2% 3W	27K
LCS-4-05	-120.0	54.0	-120.6	124	1.2	1.8	0.033 mf 400V	240 mf 200V	39 mf 200V	0.0022 mf 200V MYLAR	050	033	Not used	033	Not used	Not used	033	1-1/2	L115 (Q2 only)	38982	L115	100	100K ±10%	Not used	4.0 ±5% 5W	150K CERMET	4.0 ±5% 5W	100K

* Lambda part number



NOTES

1. RESISTOR VALUES ARE IN OHMS
2. RESISTOR WATTAGE 1/4 WATT, RESISTORS ABOVE 2 WATTS ARE WIREWOUND UNLESS OTHERWISE NOTED
3. RESISTOR TOLERANCES COMP. ±10%, WIREWOUND ±2% FILM ±1%, UNLESS OTHERWISE NOTED
4. CAPACITOR TOLERANCES ELECTROLYTIC -10%, +100%, MYLAR ±10%, CERAMIC 10%, UNLESS OTHERWISE NOTED.
5. SYMBOLS
   - INDICATES CLOCKWISE ROTATION OF SHAFT.
   - INDICATES CONNECTION TO CHASSIS
   - INDICATES ADJUSTMENT OR CALIBRATION CONTROL.
   - SEE INSTRUCTION MANUAL.
   - LAMBDA PT # FBL-00-030, USE IN 4002 DIODE FOR REPLACEMENT UNLESS OTHERWISE NOTED.
   - INDICATES TERMINAL ON PRINTED WIRING BOARD.
6. DESIGNATIONS ARE LAMBDA PART NUMBERS.
7. DERATE CURRENT 10% FOR 47-57Hz, FOR 63-440Hz CONSULT FACTORY.
8. CONDITIONS FOR CIRCUIT POINT MEASUREMENTS: INPUT: 115 VAC, 60Hz, MAX. RATED VOLTAGE NO LOAD. INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE DC UNLESS OTHERWISE NOTED. DC MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLTMETER BETWEEN +S (TERM 15) & INDICATED POINTS UNLESS NOTED; +S AND +V SHORTED, -S AND -V SHORTED
9. COAT BOTH SIDES OF INSULATING WAFER WITH DOW CORNING NO. 340 SILICONE GREASE.
10. SEE TABLE I FOR COMPONENT VALUES.
11. SEE TABLE I FOR VOLTAGE VALUES
12. IF Q2 IS REPLACED RETAIN RADIATOR AND INSTALL WITH NEW TRANSISTOR.
13. ON UNITS BEARING SERIAL NO. PREFIX A IC1 IS FBT-00-002 AND R1 IS 9.1K±2%.
14. ON UNITS BEARING SERIAL NO. PREFIX B, IC1 IS FBT-00-010. ON UNITS BEARING SERIAL NO. PREFIXES A & B, R10 IS 68M±10%.
15. ON UNITS WITH "V" OPTION, T1 HAS TAPPED PRIMARY. "V" OPTION UNITS CAN BE WIRED FOR 187-242 INPUT (USING TAP), OR FOR 205-265V INPUT (USING ENTIRE PRIMARY). ON SERIAL NO. PREFIXES A-C, "V" OPTION UNITS; T1 PRIMARY IS NOT TAPPED. AC INPUT IS 205-265V.
16. CR22 NOT USED ON UNITS WITH SERIAL No. PREFIXES A-D.
17. HC1 ONLY USED ON MODEL LCS-4-5-0V. HC1 NOT USED ON UNITS WITH SERIAL NO. PREFIXES A-E.
18. C10 NOT USED ON UNITS WITH "V" OPTION.

MODELS
LCS-4-2
LCS-4-3
LCS-4-3P6
LCS-4-4
LCS-4-4P5
LCS-4-5
LCS-4-6
LCS-4-8
LCS-4-10

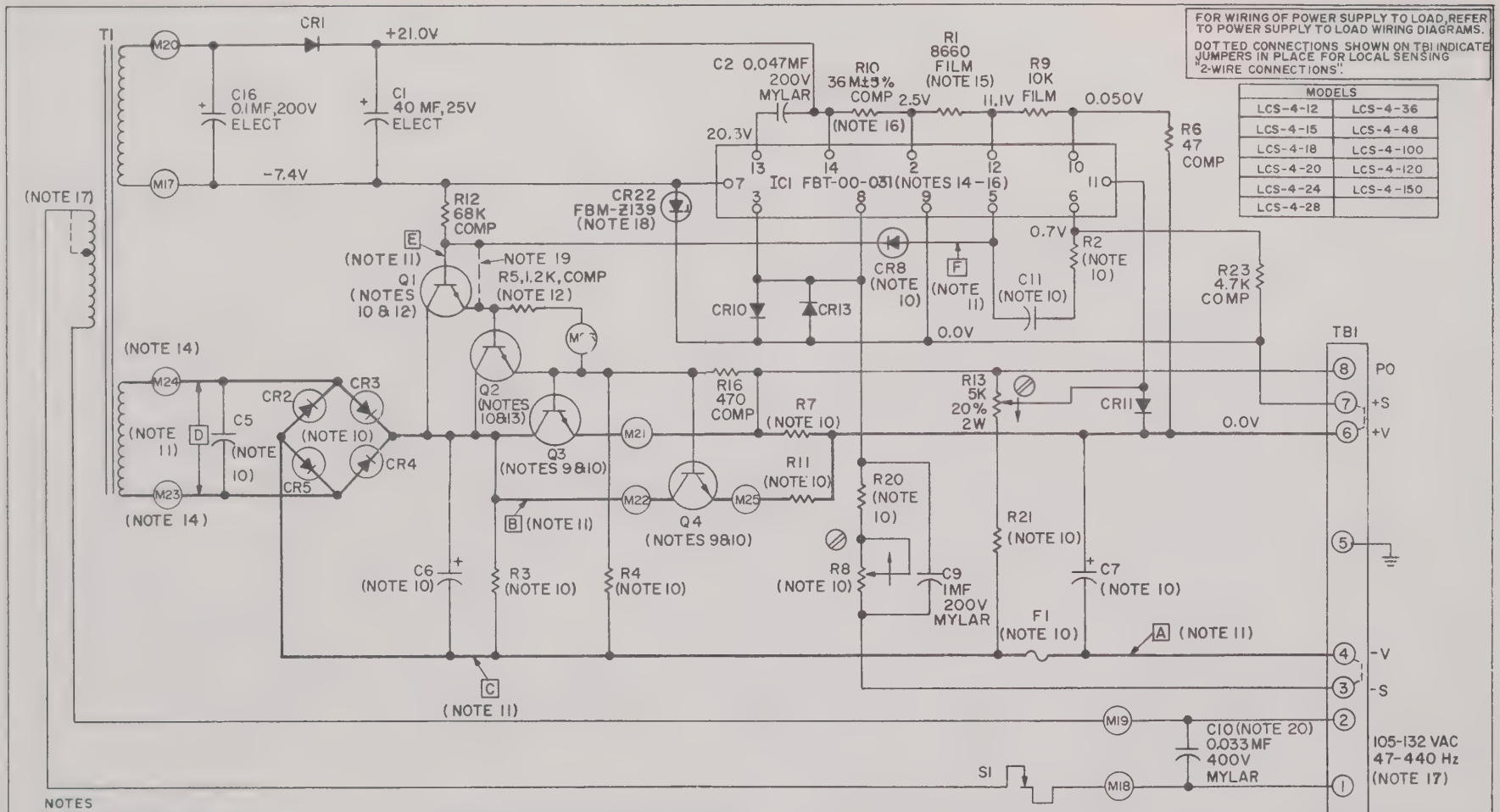
LAMBDA
ELECTRONICS
MELVILLE, L.I., NEW YORK
DIVISION OF Veeco INSTRUMENT INC.

TABLE I

DATA REFERENCES FOR

MODELS LCS-4-2 — LCS-4-10

Model	Schematic Voltage Measurements				Schematic Components				
					C6	R4	R8	R20	R21
	A (VDC)	B (VDC)	C (VDC)	D (VAC)	-10+100% ELECT	±10%, 1/2W COMP	±10%, 3/4W WW or CERMET	±5%, 1/2W FILM	1/2w FILM
LCS-4-2	-2.0	9.7	-2.0	8.2	7,500 mf 15 V	1,000	2,000	1,600	10,000 5%
LCS-4-3	-3.0	10.8	-3.0	9.7	7,500 mf 15V	2,200	5,000	2,700	15,000 2%
LCS-4-3P6	-3.6	11.8	-3.6	10.9	7,500 mf 15V	2,200	5,000	2,700	15,000 2%
LCS-4-4	-4.0	11.4	-4.0	10.9	7,500 mf 15V	2,200	5,000	2,700	15,000 2%
LCS-4-4P5	-4.5	12.7	-4.5	12.0	7,500 mf 15V	2,200	5,000	3,600	22,000 5%
LCS-4-5	-5.0	12.2	-5.0	12.0	7,500 mf 15V	3,900	5,000	3,600	22,000 5%
LCS-4-6	-6.0	13.0	-6.0	14.0	4,800 mf 20V	3,900	5,000	3,600	22,000 5%
LCS-4-8	-8.0	15.2	-8.0	16.3	4,800 mf 20V	3,900	5,000	6,800	39,000 5%
LCS-4-10	-10.0	17.0	-10.0	19.0	2,500 mf 40V	3,900	5,000	8,200	39,000 5%



NOTES

1. RESISTOR VALUES ARE IN OHMS
2. RESISTOR WATTAGE 1/4 WATT; RESISTORS ABOVE 2 WATTS ARE WIREWOUND UNLESS OTHERWISE NOTED
3. RESISTOR TOLERANCES: COMP. ±10%; WIREWOUND ±2% FILM ±1%; UNLESS OTHERWISE NOTED
4. CAPACITOR TOLERANCES: ELECTROLYTIC -10%, +100%; MYLAR ±10%, CERAMIC 10%, UNLESS OTHERWISE NOTED.
5. SYMBOLS
   - INDICATES CLOCKWISE ROTATION OF SHAFT.
   - INDICATES CONNECTION TO CHASSIS
   - INDICATES ADJUSTMENT OR CALIBRATION CONTROL.
   - SEE INSTRUCTION MANUAL.
   - LAMBDA PT. #FBL-00-030, USE IN 4002 DIODE FOR REPLACEMENT UNLESS OTHERWISE NOTED.
   - INDICATES TERMINAL ON PRINTED WIRING BOARD.
6. DESIGNATION IS LAMBDA PART NUMBER
7. DERATE CURRENT 10% FOR 47-57Hz, FOR 63-440Hz CONSULT FACTORY.
8. CONDITIONS FOR CIRCUIT POINT MEASUREMENTS: INPUT: 115 VAC, 60Hz; MAX. RATED VOLTAGE NO LOAD. INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE DC UNLESS OTHERWISE NOTED. DC MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLTMETER BETWEEN +S (TERM 15) & INDICATED POINTS UNLESS NOTED; +S AND +V SHORTED, -S AND -V SHORTED
9. COAT BOTH SIDES OF INSULATING WAFER WITH DOW CORNING NO. 340 SILICONE GREASE,
10. SEE TABLE I FOR COMPONENT VALUES.
11. SEE TABLE I FOR VOLTAGE VALUES.
12. THIS COMPONENT NOT USED ON MODELS LCS-4-100 THRU LCS-4-150.
13. IF Q2 IS REPLACED RETAIN RADIATOR AND INSTALL WITH NEW TRANSISTOR.
14. ON MODELS LCS-4-100 — LCS-4-150; IC1 IS FBT-00-030, P.C. TERMS M23 & M24 ARE ONLY USED ON THESE MODELS.
15. ON MODELS LCS-4-12 THRU LCS-4-48 WITH SERIAL NO. PREFIX A, IC1 IS FBT-00-002 AND R1 IS 9.1K ±2%.
16. ON MODELS LCS-4-12 THRU LCS-4-48 WITH SERIAL NO. PREFIX B, IC1 IS FBT-00-010. ON MODELS LCS-4-100 THRU LCS-4-150 WITH SERIAL NO. PREFIXES A&B, IC1 IS FBT-00-002. ON ALL MODELS WITH SERIAL NO. PREFIXES A&B R10 IS 68M ±10%.
17. ON UNITS WITH "V" OPTION, T1 HAS TAPPED PRIMARY. "V" OPTION UNITS CAN BE WIRED FOR 187-242V INPUT (USING TAP), OR FOR 205-265V INPUT (USING ENTIRE PRIMARY). ON SERIAL NO. PREFIXES A-C "V" OPTION UNITS; T1 PRIMARY IS NOT TAPPED. AC INPUT IS 205-265 V.
18. CR22 NOT USED ON UNITS WITH SERIAL NO. PREFIXES A-D.
19. MODELS LCS-4-100 THRU LCS-4-150 ONLY.
20. C10 NOT USED ON UNITS WITH "V" OPTION.

THIS SCHEMATIC APPLIES TO UNITS BEARING SERIAL NO PREFIXES A-

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TABLE II

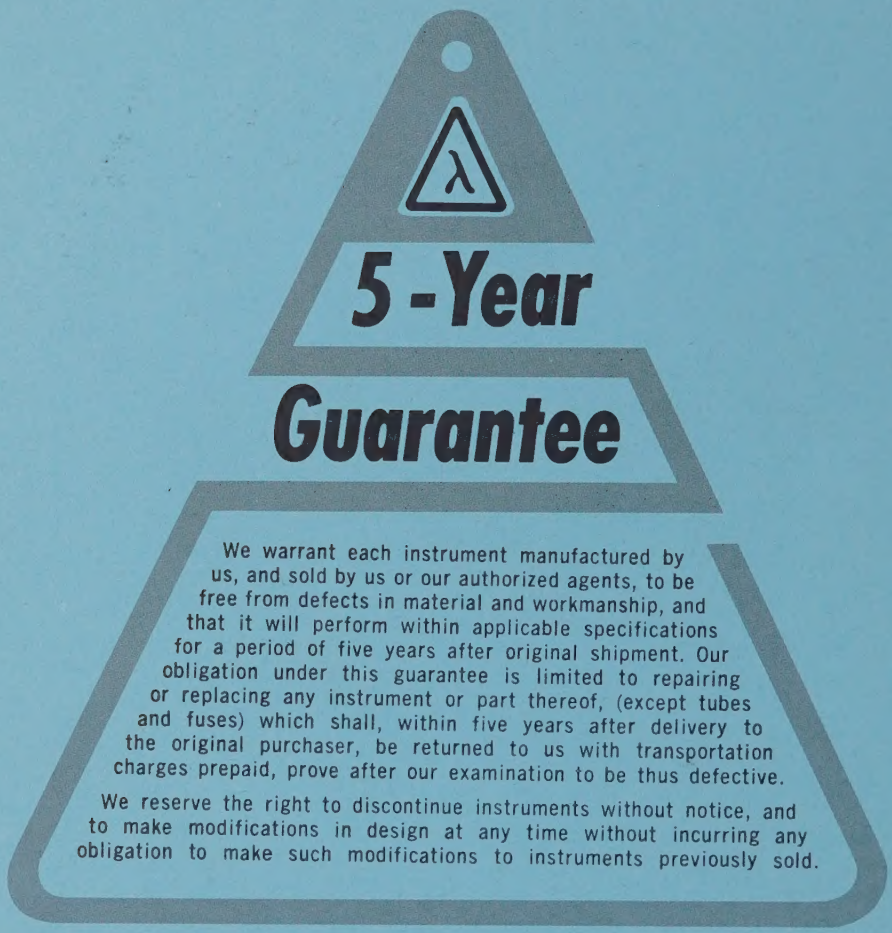
DATA REFERENCES FOR

MODELS LCS-4-12 — LCS-4-150

Model	Schematic Voltage Measurements						Schematic Components													
							C5	C6	C7	C11	CR2-CR5	CR8	F1	Q1, Q2	Q3, Q4	R2	R3	R4	R7	R8
	A (VDC)	B (VDC)	C (VDC)	D (VAC)	E (VDC)	F (VDC)	±10% MYLAR	-10+100% ELECT	-10+100% ELECT	±10%, 200V MYLAR	*FBL-f0-	*FBL-00-	(AMPS)	*FBN-	*FBN-	±10%, 1/4W COMP	1W COMP	±10%, 1/2W COMP	±5%, 5W WW	±10% 3/4W
LCS-4-12	-12	17.5	-12	21.0	1.8	2.4	0.22 mf 200V	2,500 mf 40V	450 mf 25V	0.0047 mf	054	030	7	L113	36485	150	10,000 ±10%	8,200	0.50	20,000 WW or CERMET
LCS-4-15	-15	18.2	-15	23.4	1.8	2.4	0.22 mf 200V	2,500 mf 40V	280 mf 40V	0.0047 mf	054	030	7	L113	36485	150	10,000 ±10%	8,200	0.50	20,000 WW or CERMET
LCS-4-18	-18	19.6	-18	26.5	1.8	2.4	0.22 mf 200V	2,500 mf 40V	280 mf 40V	0.0047 mf	054	030	7	L109	36220	220	10,000 ±10%	8,200	0.50	20,000 WW or CERMET
LCS-4-20	-20	19.6	-20	27.8	1.8	2.4	0.22 mf 200V	2,500 mf 40V	280 mf 40V	0.0047 mf	054	030	5	L109	36220	220	10,000 ±10%	8,200	0.50	20,000 WW or CERMET
LCS-4-24	-24	24.0	-24	34.2	1.8	2.4	0.22 mf 200V	1,600 mf 60V	175 mf 50V	0.0047 mf	054	030	5	L109	36220	220	10,000 ±10%	18,000	0.50	20,000 WW or CERMET
LCS-4-28	-28	25.0	-28	37.6	1.8	2.4	0.22 mf 200V	1,600 mf 60V	175 mf 50V	0.0047 mf	054	030	5	L109	36220	220	10,000 ±10%	18,000	0.50	20,000 WW or CERMET
LCS-4-36	-36	29.5	-36	47.0	1.8	2.4	0.22 mf 200V	1,600 mf 60V	175 mf 50V	0.0047 mf	054	030	5	L109	36487	220	10,000 ±10%	18,000	0.50	23,000 WW or CERMET
LCS-4-48	-48	35.5	-48	59.0	1.8	2.4	0.22 mf 200V	730 mf 85V	60 mf 100V	0.0047 mf	054	033	5	L108	35902	220	27,000 ±10%	18,000	0.68	23,000 WW or CERMET
LCS-4-100	-100	51.0	-100	107	1.2	1.8	0.033 mf 400V	240 mf 200V	39 mf 200V	0.0022 mf	033	033	1-1/2	L115 (Q2 only)	38982	100	100,000 ±10%	47,000	3.0	75,000 CERMET
LCS-4-120	-120	59.0	-120	127	1.2	1.8	0.033 mf 400V	240 mf 200V	39 mf 200V	0.0022 mf	033	033	1-1/2	L115 (Q2 only)	38982	100	100,000 ±10%	47,000	3.0	75,000 CERMET
LCS-4-150	-150	66.0	-150	153	1.2	1.8	0.033 mf 400V	200 mf 250V	39 mf 200V	0.0022 mf	033	033	1-1/2	L115 (Q2 only)	38982	100	100,000 ±10%	47,000	3.0	75,000 CERMET

Model	Schematic Components																			
	R11	R20	R21																	
	±5%, 5W WW	1/2W FILM	FILM																	
LCS-4-12	0.50	9,100 ±5%	68,000 2%, 1/2w																	
LCS-4-15	0.50	9,100 ±5%	68,000 2%, 1/2w																	
LCS-4-18	0.50	15,000 ±2%	100,000 1%, 1/4w																	
LCS-4-20	0.50	15,000 ±2%	100,000 1%, 1/4w																	
LCS-4-24	0.50	15,000 ±2%	100,000 1%, 1/4w																	
LCS-4-28	0.50	24,000 ±5%	120,000 1%, 1/4w																	
LCS-4-36	0.50	24,000 ±5%	120,000 1%, 1/4w																	
LCS-4-48	0.68	39,000 ±5%	200,000 1%, 1/4w																	
LCS-4-100	3.0	91,000 ±5%	432,000 1%, 1/2w																	
LCS-4-120	3.0	91,000 ±5%	432,000 1%, 1/2w																	
LCS-4-150	3.0	120,000 ±1%	432,000 1%, 1/2w																	

* Lambda part number.


5 - Year
Guarantee
We warrant each instrument manufactured by us, and sold by us or our authorized agents, to be free from defects in material and workmanship, and that it will perform within applicable specifications for a period of five years after original shipment. Our obligation under this guarantee is limited to repairing or replacing any instrument or part thereof, (except tubes and fuses) which shall, within five years after delivery to the original purchaser, be returned to us with transportation charges prepaid, prove after our examination to be thus defective.
We reserve the right to discontinue instruments without notice, and to make modifications in design at any time without incurring any obligation to make such modifications to instruments previously sold.

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